

# MODERN PLASTICS



JULY 1947

★ *New Pages from the DUREZ Diary*



● In recent years the use of short-wave diathermy in treating a long list of ailments has brought immense benefit to humanity.

Diathermy utilizes electrical induction in applying deep heat to living body tissues. This means that for the patient's comfort and for successful therapy, the material used in applicators must have a high dielectric constant. It must transmit electric effects while providing perfect insulation.

These properties are inherent in

phenolics . . . the Durez plastics. The diathermy manufacturer . . . like the producer of radios and other electrical devices . . . also obtains in Durez an ideal combination of other properties. Their mechanical strength, ease of molding to various shapes and exact dimensions, speed of production, and economy of finishing, make the Durez plastics ideal for countless uses.

Durez serves here in the treatment drum, the air-space and other applicator forms, the arm assembly, and even

in the pilot-light bezels, knobs, and meter cases of the control panel.

\* \* \*

Many new developments in the use of Durez are pictured and described in "Durez Plastics News." May we add your name to the list of those who receive this informative pamphlet each month?

Durez Plastics & Chemicals, Inc., 57 Walck Road, North Tonawanda, N. Y.  
Export Agents: Omni Products Corp., 460 Fourth Ave., New York 16, N. Y.



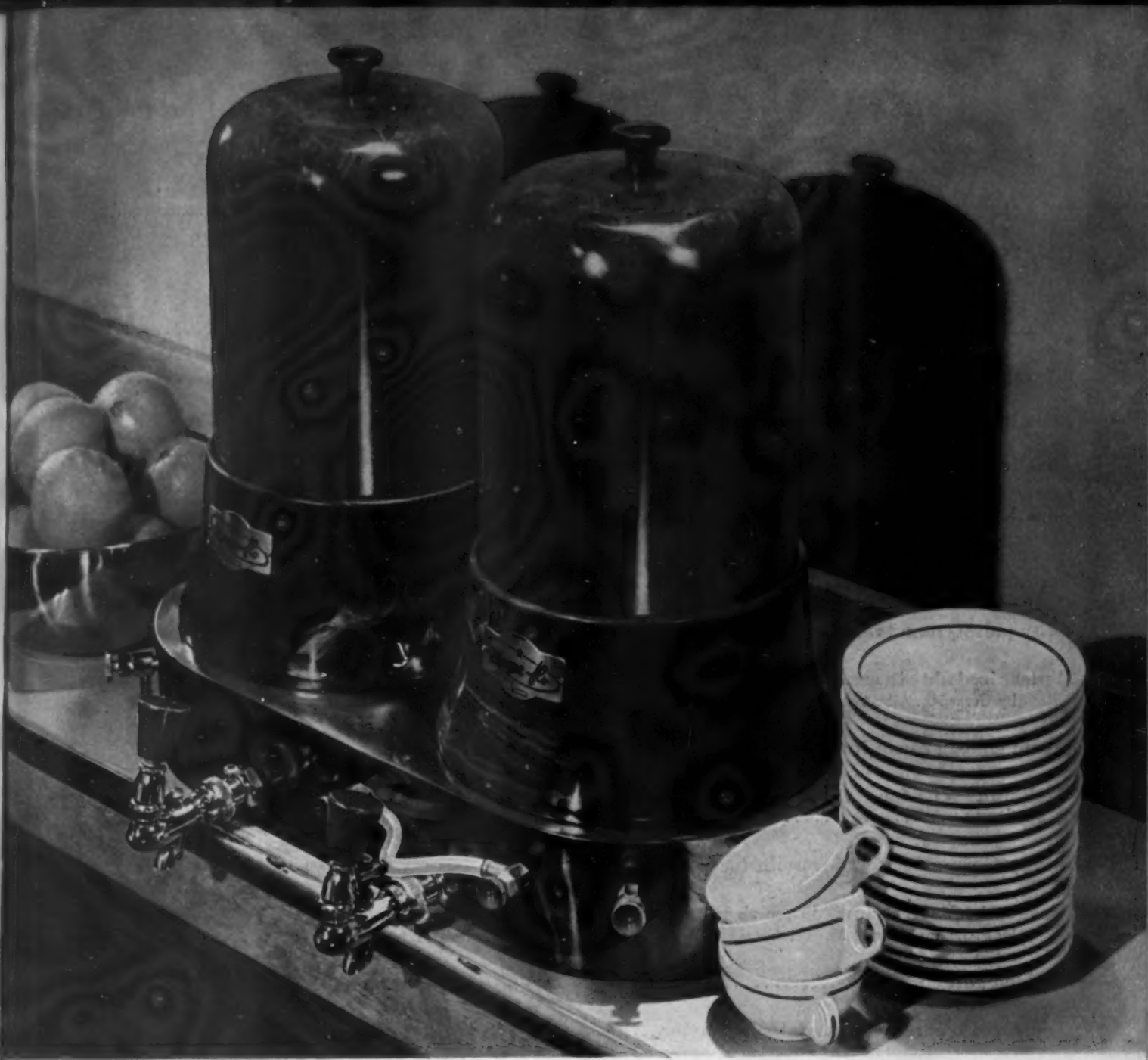
PHENOLIC  
RESINS

MOLDING COMPOUNDS

INDUSTRIAL RESINS

PROTECTIVE COATING RESINS

**PHENOLIC PLASTICS THAT FIT THE JOB**



## COFFEE...CREAM...AND *Catalin* "TO SWEETEN" THE SERVICE

Catalin now makes its bow at favorite eating spots, drawing coffee—and new friends! The presence of Catalin's rich color and polished brilliance creates an air of charm and cheery welcome as it enhances the Magic-Flo Coffee and Cream Dispenser.

Magic-Flo provides a new and better way to dispense coffee . . . serves coffee to suit individual tastes, either black or perfectly blended with cream, from the same tap . . . saving time, labor and materials. The same type of sound product planning which resulted in the development of the unique Magic-Flo two-way valve led to the selection of Catalin to enhance and to serve in this attractive modern unit.

The twin domes of Magic-Flo house separate supplies of coffee and cream

Catalin's thick, heavy, *cast* wall-sections provide the necessary insulation for the chilled cream compartment and the needed strength to withstand frequent handling. The eight gleaming Catalin parts in the assembly—knobs, domes, bases and tap handles—will not rust, stain, or lose their lustrous sheen. Magic-Flo found that only in Catalin could it obtain the perfect blending of the decorative and functional qualities meeting their requirements.

Because it adapts itself perfectly to modern styling, has an unrivalled richness and depth of color and many desirable physical qualities, product designers continue to find new uses for Catalin in many fields. Tooling costs are low, and highly developed casting techniques now offer full freedom of design

expression in all three dimensions. No other thermosetting material offers Catalin's rich range of stable color and speed of availability.

A get-together with our service staff will quickly reveal how Catalin will blend perfectly with your new product planning. Inquiries invited!

**CATALIN CORPORATION OF AMERICA**  
ONE PARK AVENUE • NEW YORK 16, N. Y.

*Magic-Flo Dispenser Unit manufactured by Harry Valve Company, Newark, N. J. Catalin elements fabricated by Acryliform Plastics Corp., Newark, N. J.*



# MODERN PLASTICS



VOLUME 24

JULY 1947

NUMBER 11

## CONTENTS

### General Section

The shower curtain problem (Editorial).....	5
Plastics improve textile machinery.....	73
Plastics are tested for train interiors.....	80
Plastics blameless in Los Angeles blast.....	83
Phenolic adapter rings solve motor bearing problem.....	84
Why polystyrene tableware?.....	86
Vulcanized fibre in arc interrupting devices..	88
by Gerard A. Albert	
Atom smasher uses low pressure laminate..	91
Melamine soda fountain jars are useful and sanitary.....	96
Many German patents remain locked up..	98
Cast resin for high-impedance circuits.....	99
by P. J. Franklin and M. Weinberg	
Molded golf club heads.....	101
Improved record needles molded of nylon...	102
Polystyrene in a non-spill desk set.....	104
Plated eyeglasses.....	144
Phenolic massager.....	146
New uses for nylon.....	148
Water softener.....	152
A vinyl dip-coat.....	156
Styrene radio case.....	160
Styrene cabinet lid.....	164

Acrylic aids lighting.....	184
Belt display boxes.....	194

### Plastics-Engineering Section

Molded vinyl phonograph records.....	107
Ridge forming acrylic sheet.....	114
by W. W. Farr and R. Tomlinson	
A hand-operated injection machine.....	117
A support fastener.....	162

### Technical Section

Effect of catalysts and pH on strength of resin-bonded plywood.....	123
by G. M. Kline, F. W. Reinhart, R. C. Rinker, N. J. de Lollis	
Methacrylate polymers in Germany.....	129
Technical Briefs.....	132
Plastics digest.....	134
U. S. plastics patents.....	136

### News and Features

Plastics products.....	92
Plastics stock molds.....	142
Consumption of plastics materials.....	154
Books and booklets.....	166
New machinery and equipment.....	172
Letters.....	180
News of the industry.....	186

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Now . . . a new polyvinyl material

## GEON Paste Resin

NO HOT MILL MIXING NECESSARY; NO VOLATILES REQUIRED FOR  
MOST APPLICATIONS; NO PRESSURE NEEDED FOR MOLDING; CAN BE CAST OR DIPPED;  
NO SHRINKAGE OR INTERNAL STRAINS IN FINISHED PRODUCTS

GEON paste resin is a new raw material that closely approaches the ultimate in simplicity of compounding and fabrication.

### *Easy to Compound*

Simply stir the resin, plasticizer, and pigments. After eliminating any trapped air the mixture is ready for fabrication into finished products. No solvents or other volatiles—no hot mill mixing (when used in making thin films or coatings it may be desirable to pulverize the resin).

### *Easy to Apply*

Compounded GEON paste polymer is especially suitable for low pressure molding. Or it may be cast as sheet or film, or as coatings for fabrics, fibres, and papers. In other applications, a simple dipping process may be used. In all cases, the application of heat

fuses the paste into a homogeneous vinyl plastic.

### *Many Outstanding Properties*

Products made from or with GEON paste resin may have all the desirable properties of products made from GEON by other methods; resistance to oils, chemicals, abrasion, heat, cold, flexing, sunlight, aging, water, flame, and most other normally destructive factors. Products made from GEON paste resin may be brilliantly or delicately colored.

### *Write for Information*

We will be glad to work with you on special problems or applications. Limited quantities of GEON paste resin are available for experimental purposes. For more information please write Department O-7, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. In Canada: Kitchener, Ontario.



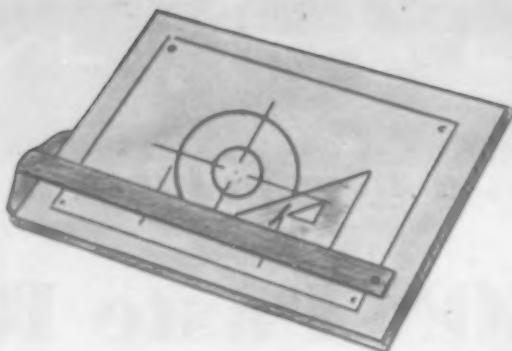
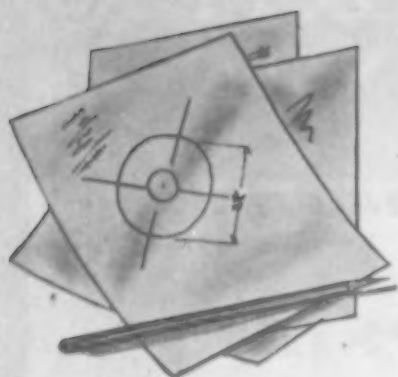
## B. F. Goodrich Chemical Company

A DIVISION OF  
THE B. F. GOODRICH COMPANY

GEON polyvinyl materials • HYCAR American rubber • KRISTON thermosetting resins • GOOD-RITE chemicals

JULY • 1947

3



## HAVE YOU A PRODUCT DEVELOPMENT PROBLEM?

Are you redesigning your product to meet new conditions . . . new competition?

Are you seeking new and better ways to utilize the selling power of plastics? If so, the solution to your problem may well hinge upon your choice of plastics molder.

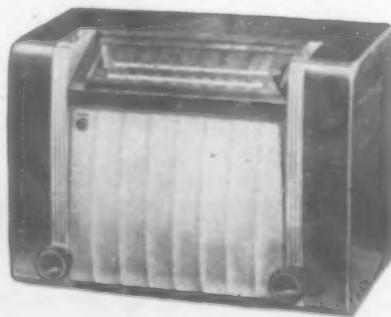
Here at Chicago Molded, product development is one of the most important phases of our business. We work closely with our customers in matters of design and engineering. We help work the "bugs" out . . . we design for economical production . . . select the material that will insure the qualities your product demands. And we produce the finished part, ready to do its job exactly as planned.

For example, the first plastics washing machine agitator was developed and molded by CMPC. The same is true of the first plastics clock case, the first plastics radio cabinet, the first plastics organ keys, and dozens more of today's soundest and best selling plastics products. The same skill which, for a quarter century, has been responsible for developments like these, is available to you NOW.

So . . . if you are working on another notable "first," or are simply redesigning your product for added effectiveness . . . we invite you to discuss your needs with us. A letter or phone call outlining your plans will bring immediate response—without obligation on your part.



**CHICAGO  
MOLDED  
PRODUCTS  
CORPORATION**



1046 N. Kolmar Avenue • Chicago 51, Illinois

Representatives in principal industrial centers

**COMPRESSION and INJECTION molding of all plastic materials**

# MODERN PLASTICS



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Write READER'S SERVICE for  
plastics information

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Production Manager: DANIEL M. BROADS  
Ass't. Production Manager: B. J. FARINA  
Executive and Editorial Offices:  
122 E. 42nd St., New York 17, N. Y.

Circulation Department  
Circulation Manager: FREDERICK A. KLEIN  
32 Broadway, New York 4, N. Y.  
Tel., Whitehall 4-4782

## Branch Offices

Chicago 1: 221 N. La Salle St.  
Manager: J. M. Connors  
Tel., Randolph 5588  
Cleveland 14: 815 Superior Ave.  
Manager: R. C. Beggs  
Tel., Superior 0737  
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Manager: A. M. Rothenberg  
Tel., Fairfax 2978

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## The shower curtain problem

"There are probably enough plastic shower curtains in inventory, on shelves, under counters and in storage to curtain the whole world," sarcastically opined a curtain manufacturer when visiting the recent exposition in Chicago.

"In addition," quoth the squire, "a good portion of them are not even fit to hang in a stable. They smell, they sweat, the print comes off and they get brittle.

"But, by golly, the phonies who manufacture such miserable imitations of the real thing can't drive me out of business. I'll stick 'till the cows come home. I've been in the coating business for 20 years. Vinyl, properly compounded, is a superior material. I can make a good product and I am betting that I can stick it out until all this junk is destroyed and the public recognizes quality film."

The man's statement is harsh, but significant. Other processors may not agree but it is interesting to note that one of the largest and oldest has dropped the word "plastic" in his advertising. His finished film is now merchandised as "flexible synthetic."

The merchandising technique for shower curtains has been a phenomenon that we believe could occur only in the plastics industry. When someone discovered that good vinyl film was ideal material for shower curtains practically every fly-by-night who could obtain a bit of vinyl plastic processing equipment climbed on the band wagon—and how they tooted those horns! This concentration on a single item not only diverted vinyl from other useful products but sopped up a large portion of scarce plasticizer. When good plasticizers were unobtainable many processors adopted substitutes with the sad result that not only shower curtains, but other vinyl products came on the market that were smelly, tacky and unfit for use. Customers rebelled, buyers fumed, managers said never again and advertisements screamed that plastic curtains were going on sale at half price.

The sad part of this one-product concentration was its utter foolishness. We wonder how many of the numerous curtain manufacturers gave any thought to the size of their market. Do they know that there are about 35,000,000 families in this country, that 9,000,000 homes lack running water, that probably 10,000,000 more are without bathrooms, that several million more have tubs but no showers? One merchandiser doubts there is a potential market of more than 7,000,000 homes for shower curtains and, even if they were all curtailed, it is doubtful that all housewives would choose plastic curtains.

There are other examples of this greed and grab type of merchandising (notably women's hand bags) in the industry and taken all together they have left many a sour taste in the mouths of potential consumers.

The pity of it all is that in many situations, properly compounded and processed vinyl is a peerless material for such things as shower curtains, hand bags, rainwear and the like. Can it be possible that this industry will continue to kick itself in the seat of its pants just for lack of a merchandising policy that insists on high grade goods channelled into markets where it has a reasonable assurance of popular acceptance?

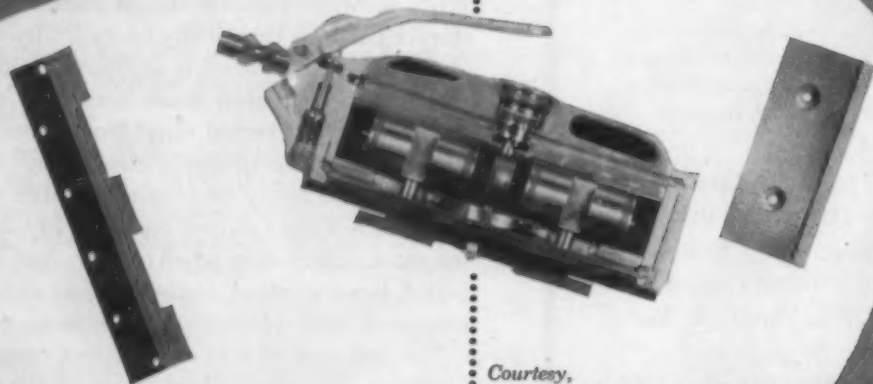
Case Histories from the RICHARDSON files

## PRODUCT DURABILITY

**Problem:** To improve life and service of gibs and retainer plates on high speed sanders. Parts must be able to withstand considerable abuse.

**Solution:** The problem was solved by the use of plastics. From the big family of INSUROK Precision Plastics, Richardson Plastics selected Laminated INSUROK, grade CG. For this material has a high natural graphitic content and is especially suited for parts subject to friction and hard usage.

For many years Richardson has been helping to solve the plastics problems of industry. Our experience is at your service. You will find it a diversified service, with skilled plasticians ready to help you mold or laminate whatever grade and type of INSUROK is best for your application.



Courtesy,  
Sundstrand Machine Tool Co.,  
Rockford, Ill.

# INSUROK Precision Plastics

## The RICHARDSON COMPANY

LOCKLAND, CINCINNATI 15, OHIO

FOUNDED 1858

Sales Headquarters: MELROSE PARK, ILL.

Sales Offices: NEW YORK: 75 WEST STREET, NEW YORK 6, NEW YORK  
CLEVELAND: 326-7 PLYMOUTH BLDG., CLEVELAND 15, OHIO  
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Factories: MELROSE PARK, ILLINOIS  
NEW BRUNSWICK, NEW JERSEY  
INDIANAPOLIS 1, INDIANA

Another new product  
from a Du Pont Plastic



## 200 LOCKUPS CAN'T LICK 'EM

*New improved lock-nuts made possible by Du Pont nylon*



### WHAT'S NEW

Here's sales-building eye-appeal for frozen foods. This crystal-clear cover of Du Pont "Lucite" protects and insulates while it displays foods stored within the cabinet. It's strong enough to support carelessly placed shopping bags... light and easy to open... dimensionally stable. And this design resists fogging. "Lucite" is economically and easily fabricated. (Frozen food cabinet manufactured by Fraser and Johnston Manufacturing Company, San Francisco, California.)

Here's something never achieved before... self-locking nuts that can be taken off when desired and used as many as 199 additional times or more without losing their firm grip!

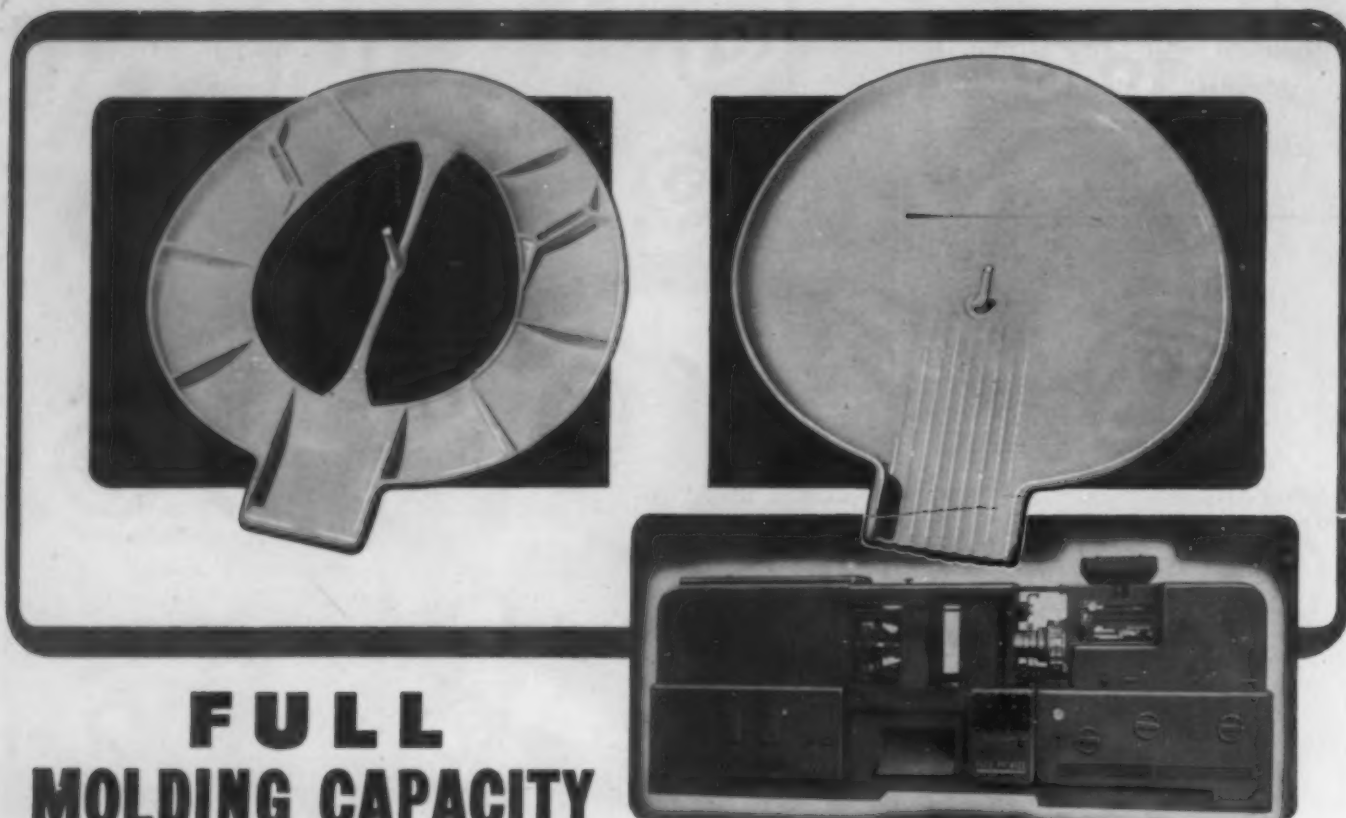
They're made with a tough, resilient insert of molded Du Pont nylon. Severe vibrational stresses can't budge them... only a wrench will remove them. For a given size, the 200th removal requires a torque that is only a few inch-pounds under that of the first removal. Nylon resists oils, solvents, gasoline, and moisture—shows little or no effect with age. These lock-nuts are easily and economically adapted to mass production... assure dependable, long-lasting service.

Study the properties of nylon... and other Du Pont plastics. Like this manufacturer, you may find a way to develop a new product... or a means of im-

proving an old one. Write now for literature. It will pay you to have it in your files. E. I. du Pont de Nemours & Co. (Inc.), Plastics Department, Room 367, Arlington, New Jersey.

Lock-nuts of various types with nylon inserts made by the Elastic Stop Nut Corp. of America, Union, New Jersey and the Nylok Corp., New York, N. Y.





## FULL MOLDING CAPACITY

*. . . by complete material control!*

The use of full molding capacity of Reed-Prentice plastic injection machines is clearly demonstrated by Plastic Molded Arts Inc., Long Island City, who mold sanitary plastic toilet covers (22 Oz. shot) and seats (19 Oz. shot) for Henry Roberts Corp. of New York City. These shots are particularly difficult since the material used is polystyrene, which in the cover, is the equivalent in weight of 27 ounces of acetate. This "plus" capacity is the result of the molders ability to do unusual molding work with an efficient machine.

Among the many Reed-Prentice machine features that make these difficult molding jobs possible are:

1. *Accuracy of amount of material delivered per cycle to the heater.*
2. *High controlled rate of plasticizing by the heater through special design and accurate controls.*
3. *Fast action of injection plunger through utilizing full volume of both pumps on material.*
4. *High locking pressure (600 tons on the 10H-22 Oz. machine) through electric steel toggle members and special pins.*

Whatever your injection molding problems may be, Reed-Prentice has a machine to give you perfectly molded parts, free from cold spots or blemishes, at a fast production rate, with rejects cut to a minimum. It will pay you to investigate our full line, which includes 4, 6, 8, 12, 16 and 22 Oz. models. Write Dept. D now for full information.

**THE WORLD'S LARGEST MANUFACTURERS OF INJECTION MOLDING MACHINES**

NEW YORK  
75 West Street

**REED-PRENTICE CORP.**  
WORCESTER MASS., U.S.A.

CLEVELAND  
1213 West 3rd Street

LOS ANGELES  
2328 S. Santa Fe Ave.

A Celanese\* Plastic

# *Takes the Impact*



PHOTOGRAPH BY GJON MILI

## ... in this Springfield Clubhead of Celcon\*

Here is the action of a swinging golf club... stopped at the moment of maximum impact... in a millionth of a second by the famous stroboscopic light!

It's a dramatic demonstration of strength in a plastic, for the clubhead is made of Celcon\*, a Celanese plastic.

Celcon, outstanding for strength and toughness in all temperatures, was selected after exhaustive tests by the golf club manufacturer... 6681 blows in the driving machine without damage (a total of 10 years of average golfclub life)... and the equivalent of 4 years of ordi-

nary exposure in the Weatherometer!

Celanese research has made Celcon and other Celanese plastics the most versatile family of plastics produced today. For products that can benefit from extra strength, surface beauty, unlimited color—and the economy of high speed molding—a Celanese Plastic is generally the answer. Plastics Division, Celanese Corporation of America, 180 Madison Avenue, New York 16, N. Y., producers of cellulosic plastics sold under the trademarks: FORTICEL\* LUMARITH\* VIMLITE\* CELLULOID\* and CELCON\*.

# *Celanese\* Synthetics*

CLUBHEAD MOLDED BY  
PROLON PLASTICS DIVISION,  
PRO-PHY-LAC-TIC BRUSH COMPANY  
FOR SPORTING GOODS, INC.

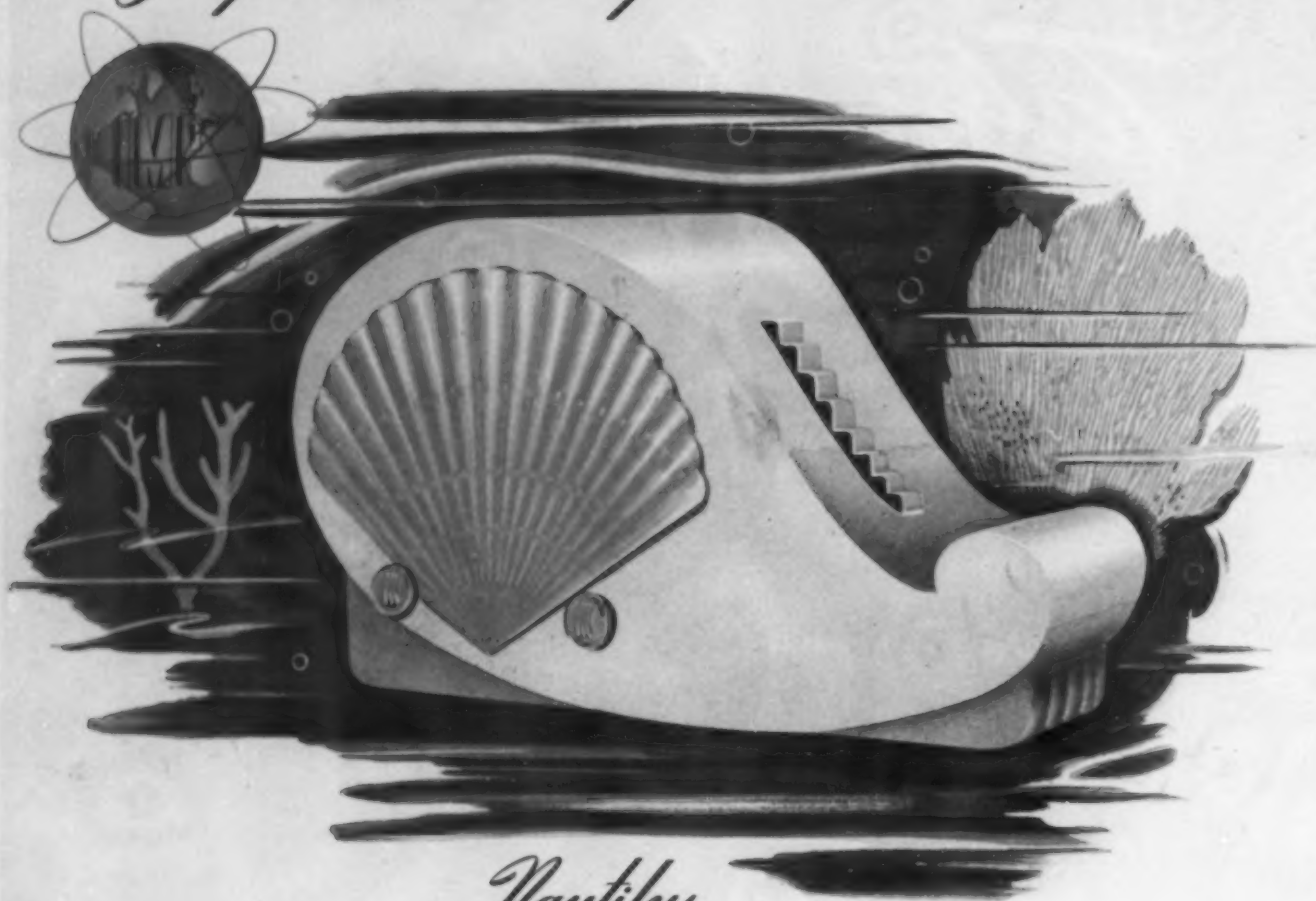
\*Reg. U. S. Pat. Off.

CHEMICALS... TEXTILES AND PLASTICS

JULY • 1947

9

*Compression Molding Tunes in on Tomorrow...*



*Nautilus*

The imaginations of today become the realities of tomorrow. ☆ We invite those who think ahead to think of *International Molded Plastics, Inc.* for quality molding of modern design.

**INTERNATIONAL MOLDED PLASTICS, INC.**



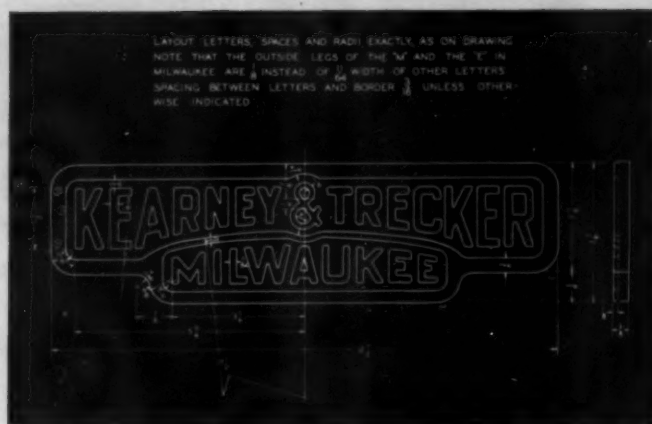
4387 WEST 35TH STREET • CLEVELAND 9, OHIO



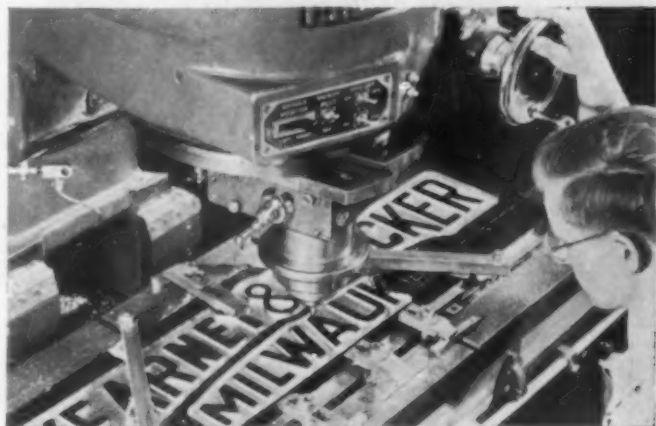
# Here's How to Make a Name for Yourself —in 55 Hours!



**1** **FAST!** Here's 2 metal pattern jobs that ordinary methods take lots of time and effort to produce. Using a Rotary Head Milling Machine, they were simplicity itself. Operator accurately located each workpiece and one working center. The rest was simply following blueprints and simple arithmetic.



**2** **DIRECT!** Regardless of jobs — pattern molds, tools, dies, hobs, cavity molds or production parts, the Rotary head milling machine transmits the blue-print dimension direct to the workpiece. No fussing with templets or models. Operator relies on simple, precise control of cutter and table movements.



**3** **ACCURATE!** Machine features precision control of all cutter movements in any plane — enables operator to accurately locate and generate complex angles and contours. It reduces chance for error, because most jobs, even if somewhat large or complex can be completed in one or two set-ups.



**KEARNEY & TRECKER  
CORPORATION**

MILWAUKEE 14, WISCONSIN

4722

**4** The Kearney & Trecker-Milwaukee Rotary Head Milling Machine offers a conservatively estimated 35% savings in use on a major percentage of tool, die, mold, or production work within working range. For complete data write for bulletin 1002C



**BENCH MODEL**

**\$245** . . . f.o.b. Cleveland

Note simplicity of design, sturdy 22" diameter wheel, easy handling controls. Thermostatic control to 600°F., thermometer to 800°F.

**FLOOR MODEL**

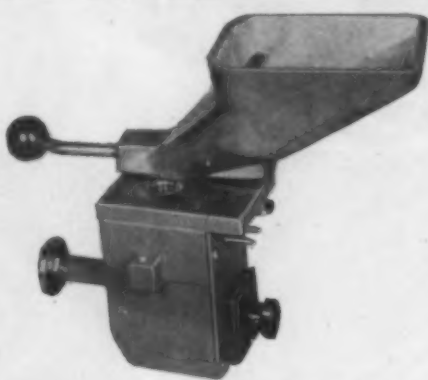
(not shown)

**\$315** . . . f.o.b. Cleveland

# NEW 3/4 OZ. INJECTION MOLDER

**Lowest-Cost Molding Machine of Its Size  
Changes Materials and Colors in 3 Minutes  
Molds All Thermoplastics—**

(Cylinder Assembly for Nylon furnished at extra charge.)



**INTERCHANGEABLE CYLINDER ASSEMBLY**

**\$75** . . . f.o.b. Cleveland

The demountable heart of the MINIJECTOR. Quick-changes on both Bench and Floor Models. Combines 2-pound capacity hopper, heater, cylinder and injection nozzle. Hopper, directly over heating chamber. Piston diameter is 3/4".



**MOLDING DIE BLANKS**

Per set in alloy steel **\$18<sup>50</sup>**

Per set in brass . . . **\$16<sup>50</sup>**

Tapered, self-locking, inexpensive. Width 2", length 4 1/2", height 2 5/8". Blanks fit Bench and Floor Model MINIJECTORS.

Designed for molding plants, laboratories and schools, the new MOSLO MINIJECTOR\* is ideally suited for the fast production of color chips and samples, tensile and compression bars, small custom moldings and mold testing runs. Cost is appreciably less than that of other hand-operated injection molders of its size.

The MINIJECTOR can be switched from the molding of one material or color to another in less than *three minutes* without costly halts for flushing or cleaning. This is accomplished through the use of

interchangeable injection mechanisms which can be quickly mounted or demounted on the main frame above the mold cavities. The method eliminates both production down-time for flush-cleaning and the material wastage which such cleaning involves.

The interchangeable injection units fit both Bench and Floor Model MINIJECTORS. It is recommended that the number of additional injection units assigned for use with each MINIJECTOR be based upon the normal frequency of color and molding compound changes in specific plant practice.

**MOSLO MACHINERY CO., DEPT. MPL-7**

2443 Prospect Avenue • Cleveland 15, Ohio

Gentlemen:

Please acknowledge my order for the following:

Quantity		Price*
<input type="text"/>	MINIJECTOR, Bench Model @	\$245
<input type="text"/>	MINIJECTOR, Floor Model @	315
<input type="text"/>	Cylinder Assemblies @	75
<input type="text"/>	Die Blanks, Alloy Steel @	18.50
<input type="text"/>	Die Blanks, Brass @	16.50

Name \_\_\_\_\_ Position \_\_\_\_\_

Firm \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

\* All prices F.O.B., Cleveland. Add 7 1/2% for export.

← This coupon is provided for your convenience in ordering. Where further information is desired, write Moslo Machinery Company, Dept. MPL-7, 2443 Prospect Avenue, Cleveland 15, Ohio.

\* Due to popular demand the 1/2 oz. LABMASTER, introduced at the Chicago SPI Show, will now be available in 3/4 oz. capacity only in all standard models. For better equipment identification the 3/4 oz. unit will be known as the MOSLO MINIJECTOR.

**MOSLO  
MACHINERY CO.  
CLEVELAND, OHIO**

# 80 shots per hour—

## 1280 TUBE SOCKETS . . .

## 40 SQ. IN. PROJECTED AREA!

Cut these fluorescent tube sockets from their sprues and they're ready for assembly. Each is filled out perfectly, exact in details and dimensions—typical of production from H-P-M injection molding machines.

Producing small parts like these in multiple cavity molds gives you *quantity* production at minimum labor cost. Or you can make large parts with equal economy, because H-P-M injection molding machines have capacity and speed.

Self-contained and all-hydraulic, these machines provide simpler, safer operation. Upkeep costs are very low. The H-P-M design gives you fast plasticization with two zone electric heat, positive mold sealing with straight line hydraulic mold clamp, fast die changeover, and continuous high-speed production.

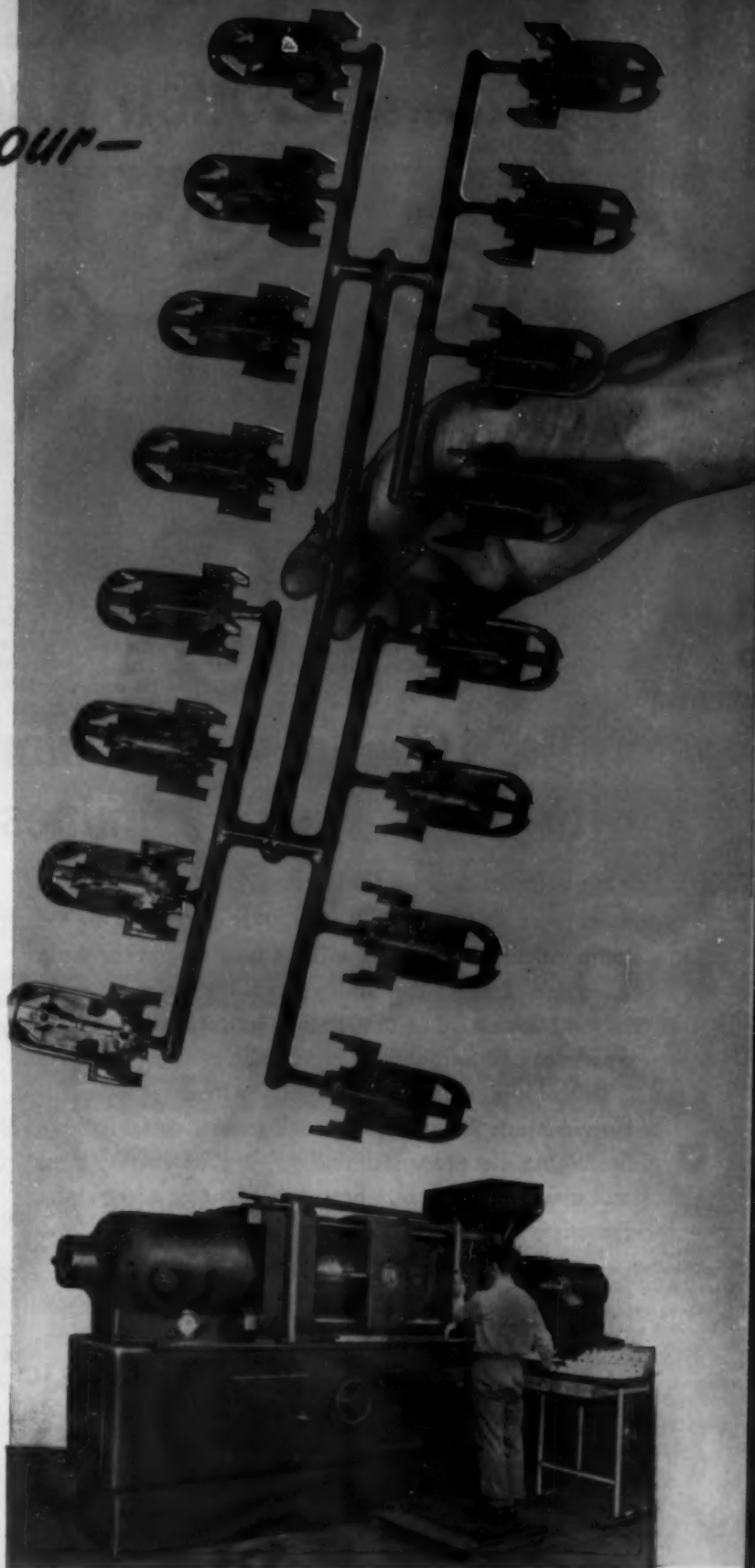
H-P-M injection molding machines are available in 4, 9, 16, and 32-ounce capacities.

Bulletin 4405 describes the 16-ounce H-P-M injection molding machine. Send for free copy.



**THE HYDRAULIC PRESS MFG. COMPANY**  
1010 Marion Road, Mount Gilead, Ohio, U. S. A.

Branch Offices in New York, Philadelphia, Cincinnati, Cleveland, Columbus, O.,  
Detroit, Pittsburgh and Chicago. Representatives in other principal cities.  
Export Dept: 500 Fifth Avenue, New York, N. Y. Cable—"Hydraulic."



This 16-ounce H-P-M injection molding machine works for Kuhlman Plastics Company, Kansas City, Mo.



*All-Hydraulic  
Self-Contained*

## Injection Machines

FOR MOLDING THERMO-PLASTICS

REVOLUTIONIZING PRODUCTION WITH HYDRAULICS SINCE 1877

# A Friendly TOUCH WHEN Lights ARE OUT!



CHILDREN especially like the friendliness of the "glow" emitted by the Horse Head\* Phosphorescent Pigment incorporated in the sheet Marcolite (Marco Chemicals, Inc.) from which the above shade was made by Ever-Glo Plastics Products Co. The design is silk screened in non-luminous colors, and in the dark it appears black against a glowing background.

## MORE Products Made More Useful-Easier to Sell with Horse Head\* Luminescent Pigments

As a lighthouse guides a mariner safely to port, so these "luminous" shades guide you back to the lamp quickly, safely, and without fumbling in the dark. They are ideal for the child's room, the guest room—in fact all rooms in homes, hotels, hospitals, clubs, and wherever else lampshades are used.

Other applications that promise attractive sales futures include "luminous" clocks (cases, dials, hands), flashlights, electric switch and outlet plates, safety signs and markers (for hotels, hospitals, theaters, night clubs, factories, and other public, commercial, or industrial buildings), door and cabinet "hardware," table tops, house numbers, etc.

Our technical staff is ready to work with you, your molder or plastics supplier on any phase of luminescent plastic applications.

\*Reg. U. S. Pat. Off.



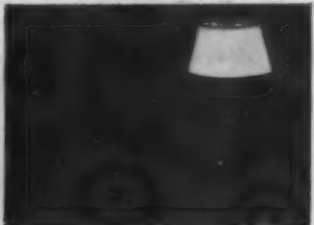
**THE NEW JERSEY ZINC COMPANY**  
160 Front Street • New York 7, N. Y.



THIS shade was made "luminous" by silk screen printing the design in a phosphorescent color on Polyplastex Synakyn (Polyplastex United, Inc.). Shade made by Display-Sales, Inc.



"Luminous" effect also obtained by silk screen printing of the design in phosphorescent paints on the inside surface of plastic sheeting. Shade made by The Velvetone Co.



OTHER rooms too need the friendly, guiding glow of a "luminous" lamp shade, such as the one above made of Marcolite.

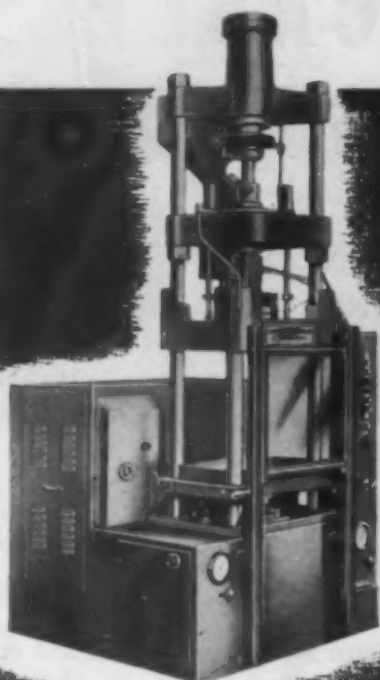
To Obtain the Longest, Brightest Afterglow, Always INSIST on Horse Head Luminescent Pigments

Production-proved for **SPEED** and **ECONOMY**

**WATSON-STILLMAN**

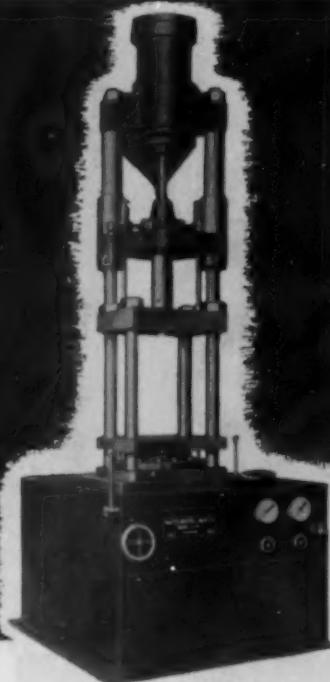
**vertical injection**

**molding machines**



4-OZ.  
VERTICAL INJECTION  
MOLDING MACHINE

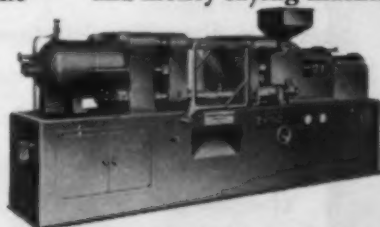
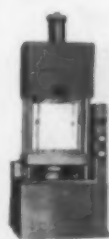
2-OZ.  
VERTICAL INJECTION  
MOLDING MACHINE



Molding speeds equal to horizontal machines and low operating cost have been production-proved for Watson-Stillman's new 2 and 4-ounce vertical injection molding machines in conventional molding.

The horizontal plane of the die in these compact machines gives added flexibility and economy in insert molding by speeding up the placing of inserts and facilitating removal of finished parts. Mold set-up time

is considerably reduced. Inserts with expensive locating bosses or extensions are not required. Die damage is eliminated in the vertical machine by the fixed horizontal position of the inserts during closing of the mold. Inserts attached to wires can be molded economically. Less floor space is needed. Write for Bulletin 624-A and 624-A1 for a detailed description for the above time and money-saving machines.



Horizontal Injection Molding Machines — 8 to 80 ounces.

See Watson-Stillman regardless of your requirements. For Watson-Stillman offers a complete line of horizontal and vertical injection machines, transfer machines, compression presses, hobbing and general purpose presses.

Transfer Molding Machines — 50 to 1200 Tons.

Compression Molding Presses — 50 to 1200 Tons.

Preform Tableting Machine—100 Tons.

**WATSON-STILLMAN**

HYDRAULIC MACHINERY DIVISION

Established 1848

FACTORY AND MAIN OFFICE  
ROSELLE, NEW JERSEY

BRANCH OFFICES  
PHILADELPHIA, PA. CHICAGO, ILL.

REPRESENTATIVES

BUFFALO, N. Y.	Industrial Equipment Co.
CHICAGO, ILL.	E. L. Easley Machinery Co.
CLEVELAND, O.	Frank T. Goetz Machinery Co.
DALLAS, TEX.	Perry Machinery Co.
DETROIT, MICH.	Peninsular Machinery Co.
DULUTH, MINN.	Anderson Machine Tool Co.
GRAND RAPIDS, MICH.	E. L. Easley Machinery Co.
HOUSTON, TEX.	Perry Machinery Co.
INDIANAPOLIS, IND.	W. K. Millholland Machinery Co.

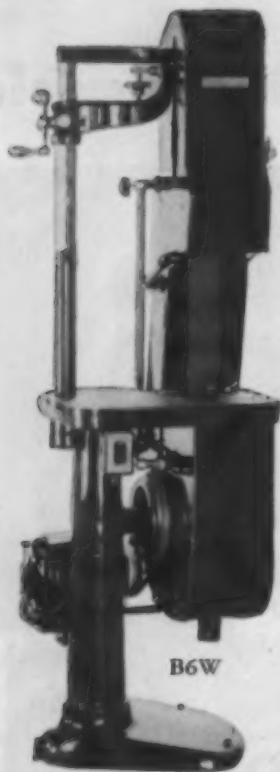
LOS ANGELES, CAL.	Hoffman and Hearty
MILWAUKEE, WIS.	E. L. Easley Machinery Co.
NEW YORK, N. Y.	Eastern Railway Supplies, Inc. (R. R. Equip.)
PITTSBURGH, PA.	Stanley Berg & Co.
ROCHESTER, N. Y.	Industrial Equipment Co.
SAN FRANCISCO, CAL.	Jenison Machinery Co.
ST. PAUL, MINN.	Anderson Machine Tool Co.
SYRACUSE, N. Y.	Industrial Equipment Co.
TULSA, OKLA.	Perry Machinery Co.
WASHINGTON, D. C.	Ralph Payne (R. R. Equip.)

CANADA: Canadian Fairbanks-Morse Co., Ltd. • Branches in All Principal Cities

Foreign Sales Representatives: OMNI PRODUCTS CORP., 460 Fourth Avenue, New York 16, N. Y. Correspondents Throughout the World

MANUFACTURERS OF THE MOST COMPLETE LINE OF HYDRAULIC MACHINERY

# CUT YOUR CLEAN-UP COSTS



## PORTER-CABLE *Abrasive* BELT SURFACER

### Increase your profits with *FASTER FINISHING*

The Porter-Cable Wet or Dry Belt Surfacers remove gates . . . parting lines . . . flashings. They finish rough spots . . . smooth molded defects and deep surface scratches. In fact, they're so versatile that they will produce quicker and better finishing on any thermoplastics or thermosetting plastics regardless of shape or contours.

### The Porter-Cable Abrasive Belt is easily adapted to various contours

Since the belt is flexible, it is quickly adapted to different shapes and contours by means of platens or rolls back of the belt.

Notice in the detail illustration how the flexible belt follows the contour of an ordinary metal pulley used as a platen. The convex workpiece will fit snugly into the curved belt.



Detail of B6W at work

### Speed up clean-up — the better modern way

The Porter-Cable Abrasive Belt Surfacers reduce flow, discoloration, burning, dust and loading of belt. They do not leave tool marks to cause cracks or checks in urea plastics. They finish both flat and curved surfaces faster, cheaper and more accurately.



WG4

WRITE TODAY  
FOR ALL THE FACTS

PORTER-CABLE MACHINE CO.  
1606-7 N. Salina St., Syracuse 8, N.Y.

Please send me money-saving facts about your Abrasive Belt Surfacers.

Name: .....  
Position: .....  
Company: .....  
Address: .....

**PORTER-CABLE**  
MACHINE COMPANY

1606-7 N. SALINA ST., SYRACUSE 8, N.Y.



## How do the **KYS-ITE EXTRAS** figure in your designing problem?

Specifications call for an EXTRAordinary material?  
You'll be wise to call for KYS-ITE!

Here's why: a list of seldom-found-together advantages offered by no other type of material.

**GREAT STRENGTH WITH LIGHT WEIGHT**—Pre-formed before curing; impact strength up to 5 times that of ordinary plastics.

**A QUEEN OF BEAUTY**—Lustrous colors are part

of the material itself. Permanent good looks—a wipe and it's bright!

**KYS-ITE CAN "TAKE IT"**—Durable and resistant to abrasion, impervious to mild alkali and acid solutions, grease and boiling water.

**ADAPTABILITY**—Lends itself to large hollow pieces, complicated pieces with projections or depressions, large or small shapes with flat surfaces or thin wall sections.

**NON-CONDUCTOR**—KYS-ITE's dielectric properties are important where safety is a factor. Poor conductor of heat and cold. Non-resonant, non-reverberating.



We're looking for molding jobs—tough ones are our specialty! We custom mold to specifications, deliver units of guaranteed quality. Interested? Write us for particulars.

**KEYES FIBRE COMPANY**  
420 Lexington Avenue  
New York 17, New York  
Plant at Waterville, Maine

**KEYES**  
MOLDED PRODUCTS

**A FULL MEASURE OF VALUE:**



## GP-Molding Powders for Mass-Market Products

**I**T's the essential **QUALITY** of the molding powders you buy, as well as its cost and *utilitarian* value that determines profits and repeat sales in mass-markets. To molders of these types of plastic products we bring a refreshing knowledge of what constitutes basic advantages in the powder, the raw material required.



We grind, blend and prepare thermoplastic molding powders with a comprehensive knowledge of standard procedure, *PLUS* an *extra* know-how that has paid off in new business and satisfied customers.

Would you like samples? Merely tell us *what* you plan to make, so we can send you the proper quality.

Large scale producers —  
**EVERY TYPE THERMOPLASTIC  
INJECTION POWDERS**

CELLULOSE ACETATE—POLYSTYRENE—  
ETHYL CELLULOSE—BUTYRATE—VINYL & ACRYLIC

Write us for details; or  
Telephone CRanford 6-2900

Cable Address: "Gering" Kenilworth, N. J.



# GERING PRODUCTS, Inc.

NORTH SEVENTH ST.

KENILWORTH, N. J.

*"Masters of Magic in Thermoplastic conversion"*

# HIT THE MARKET QUICK

with your new plastic product

- High speed mold making
- Unsurpassed machine shop facilities
- Streamlined production methods

**K**LINE'S quick conversion of product idea to finished, high-performance molds puts your presses in production weeks or months earlier, puts sales profits in company coffers that much sooner.

Here's how it's done. . . . Unsurpassed tooling facilities and sure-skilled, fast-moving machinists are backed up by experienced designers. Quick-thinking production engineers get jobs done before others begin to think about them. A work-flow plan, devised by efficiency experts, guarantees rapid, uninterrupted action on production of your order every step of the way from blueprint to shipping of the finished mold.

Before committing yourself to the so-called "unavoidable" money wasting delays involved in tooling-up, compare Kline's delivery dates—

and costs—with those of any other mold maker in the country.

To make sure you get help in a hurry, we'll fly a man to you. Just fill out the coupon—there's no obligation to you.

**THE KLINE MANUFACTURING CO.**  
Galena, Ohio



Gentlemen:

Fly your representative to us.  
Wire when he will arrive. We have a pressing problem involving:

- ☐ transfer    ☐ injection    ☐ compression molds
- ☐ total cost of finished molds
- ☐ earliest possible delivery date
- ☐ design changes for best molding results

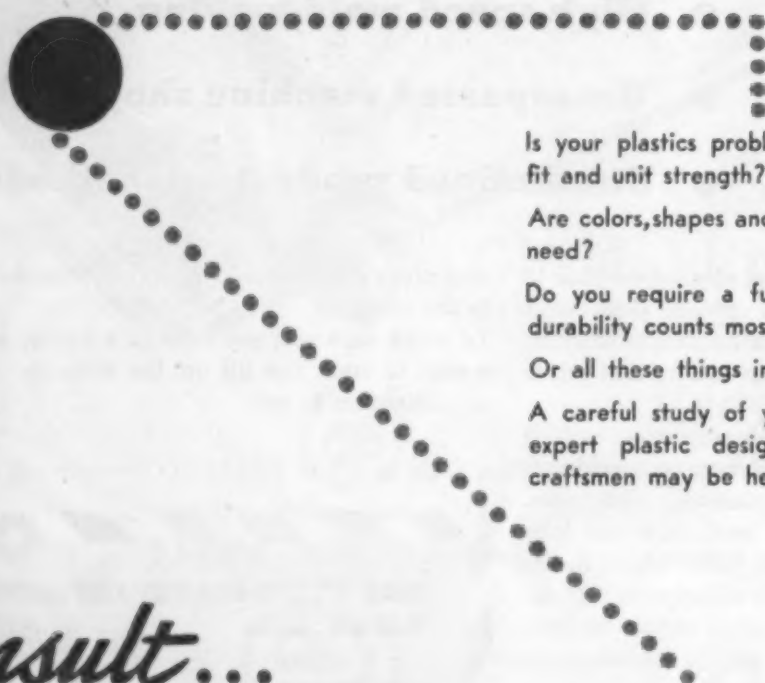
Name .....  
Position .....  
Firm .....  
Address .....  
City ..... Zone ..... State .....

**THE KLINE**  
*Manufacturing*  
**COMPANY**

GALENA • OHIO



*the*  
**Answer\***



Is your plastics problem one of precision fit and unit strength?

Are colors, shapes and sizes your particular need?

Do you require a functional item where durability counts most?

Or all these things in one . . . ?

A careful study of your problem by our expert plastic designers, engineers and craftsmen may be helpful.

*\*Consult...*

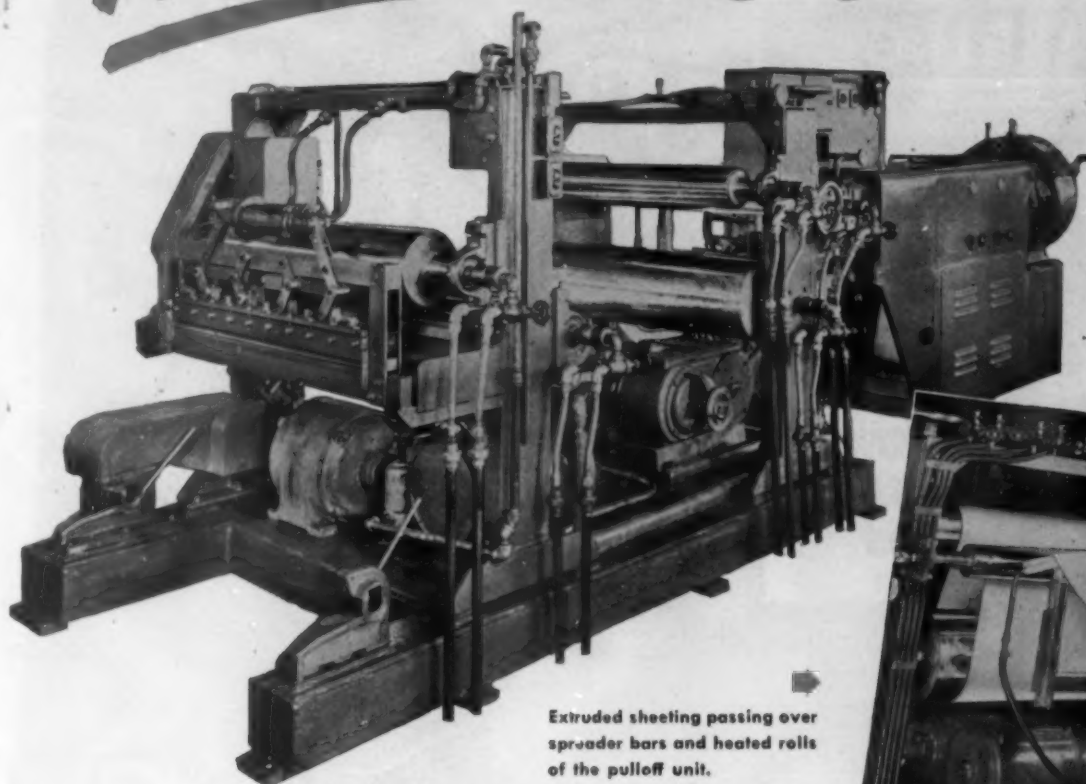
**"YOUR PLASTICS DEPARTMENT"**



**MINNESOTA PLASTICS CORP.**

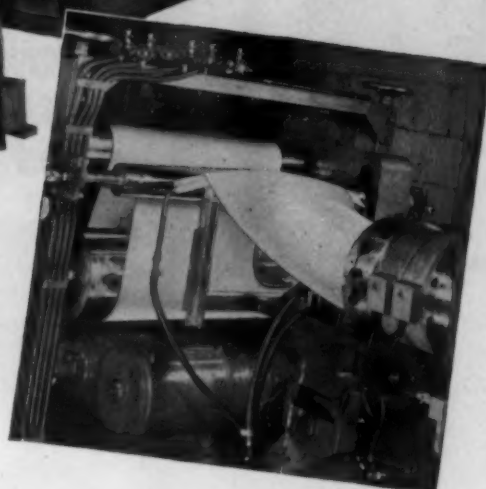
**366 WACOUTA STREET  
ST. PAUL 1, MINNESOTA**

# ***NOW!*** direct extrusion of thin-gage sheet



Complete NRM Direct-Process Sheeting Unit; including 3½" extruder, special sheeting head, with cooling and pulloff unit equipped with automatic cutoff and continuous windup. Finished product can be cut into sheets or wound on reels.

Extruded sheeting passing over spreader bars and heated rolls of the pulloff unit.



## Costs slashed, new markets created by NRM Direct-Process Extruder and Pulloff Equipment

**N**OW, for the first time, an equipment manufacturer is able to offer the plastics industry a complete, full scale production unit for the direct extrusion of acetate and other types of thin-gage sheet.

### Here's what that means:

1. Production costs are drastically cut ... as much as one half; unit will produce up to 150 lbs. of finished sheet per hour;
2. New markets, new products, and new uses for established products are made possible;

3. Thin-gage sheet output is greatly increased per dollar of capital investment, or:

4. Substantially less investment is needed for a given output of product;
5. Produces directly extruded material up to 22 inch trimmed width, 8 to 45-thousandths thickness. (Larger head for 36 inch wide sheet can be made available.)

The NRM Direct-Process sheeting unit is rugged, compact, requires a minimum of floor space. It consists of a 3½" NRM extruder

and special sheeting head, plus a cooling and pulloff unit with automatic cutoff and continuous windup for 36 inch untrimmed sheets. It is built by National Rubber Machinery Company, America's foremost designer and manufacturer of plastics extruders and extrusion equipment.

If you've been waiting for a practical, low-cost method of sheet production, here's your answer.

For full information, including photographs, specifications and floor layouts write us today.



**NATIONAL RUBBER MACHINERY CO.**

General Offices: AKRON 8, OHIO

*Plastics*

MACHINERY DIVISION

Export Distributors: OMNI PRODUCTS CORPORATION, 460 Fourth Avenue, New York 16, N. Y.

JULY • 1947

21




TO MEET THE GROWING INDUSTRIAL DEMAND...

## AERO BRAND STEARATES

CALCIUM...ZINC...ALUMINUM...MAGNESIUM

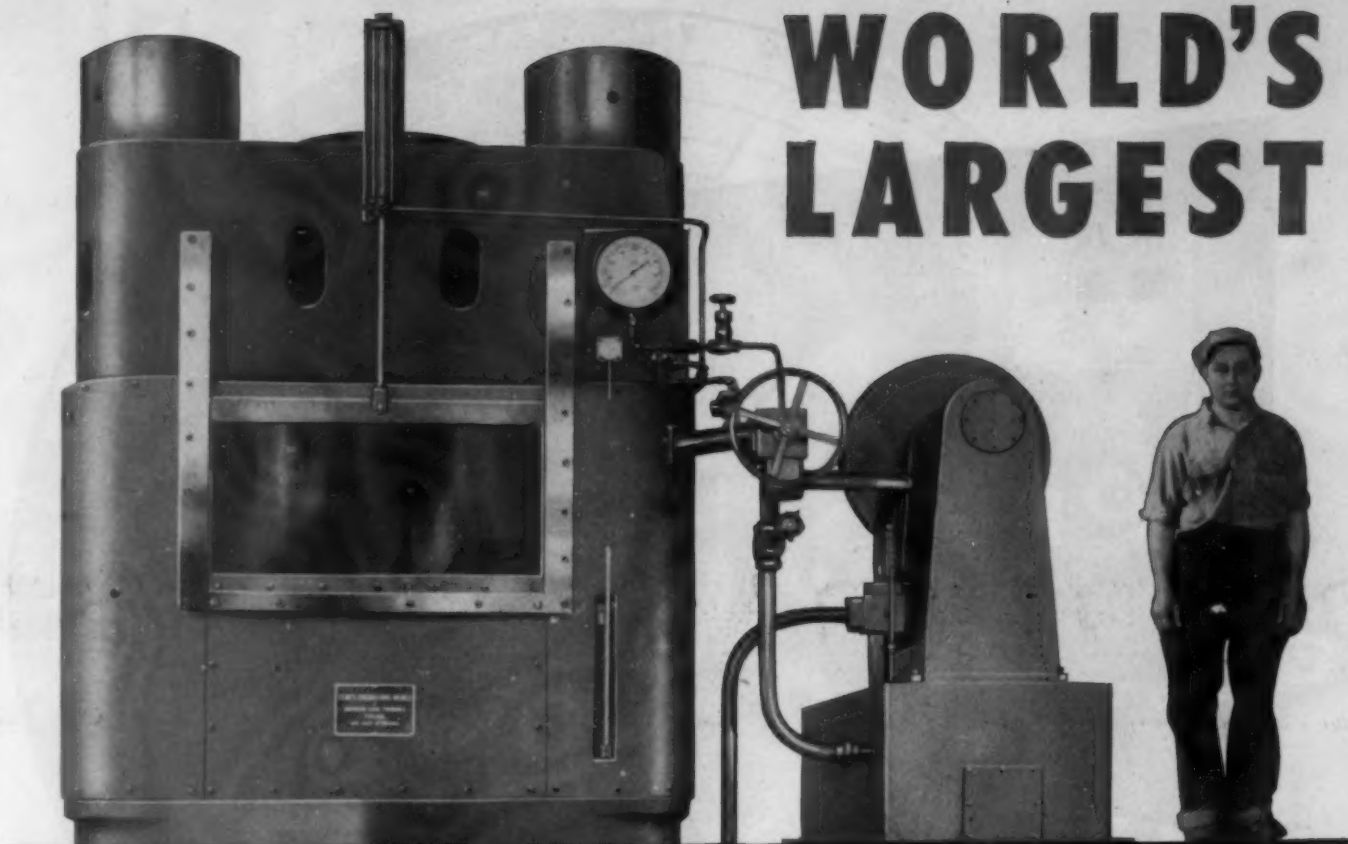
CYANAMID's large-capacity, rigidly controlled manufacturing facilities offer exceptional advantages as your source of supply. Thorough inspection and meticulous control at each step from the acid to the final packaged product bearing the AERO\* BRAND Seal make certain that your stearates will be fine and fluffy... with clean, smooth dusting lube qualities... and possessing the many other superior diversified processing characteristics inherent in each type. For product quality... for service... for all-around dependability... it's CYANAMID AERO BRAND STEARATES.

CYANAMID'S MODERN  
FACILITIES BECOME  
YOUR DEPENDABLE  
SOURCE OF SUPPLY  
WHEN YOU SPECIFY...

 **AERO BRAND  
STEARATES**



# WORLD'S LARGEST



## pressures up to 16 MILLION POUNDS

Giant Elmes hobbing presses such as this are used to deliver pressures up to 16,000,000 pounds. Big? Yes! Yet, because of the compact construction, over-all dimensions can't possibly indicate the *tremendous* force of these presses.

Sinking hardened hobs into prepared blanks of cold steel calls for (1) irresistible pressure, (2) utmost rigidity, (3) instant response to sensitive control, and (4) *implicit* operator confidence. Elmes hobbing presses are famous for accurate work.

All sizes, from 175 tons upward, combine many features of design and construction which make these presses *precision tools* in skillful hands. Recommendations and helpful suggestions are yours for the asking.

# ELMES

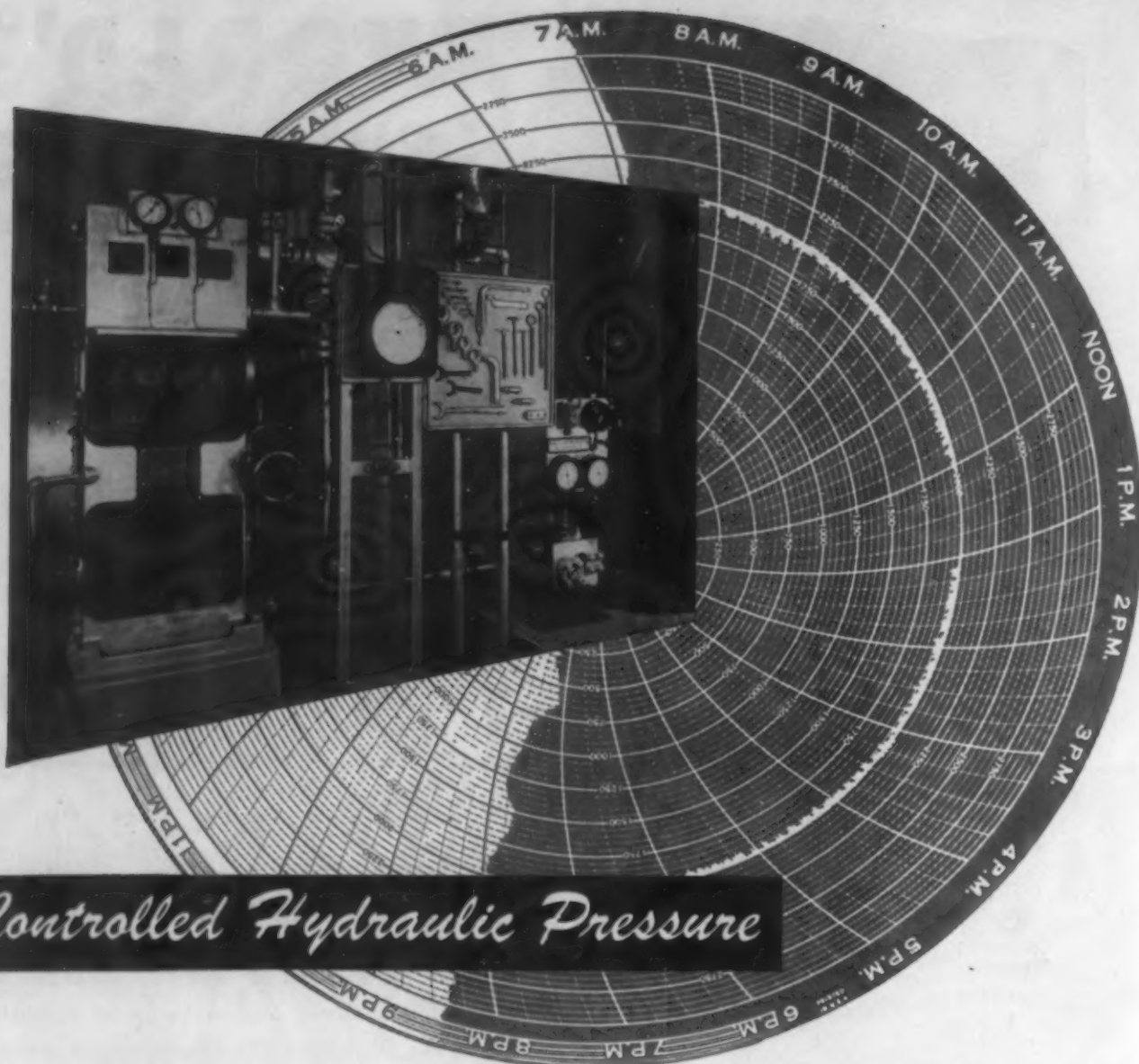
*Since 1851*

## HYDRAULIC EQUIPMENT

NEW BULLETIN 1030B describes both the hobbing process and modern Elmes hobbing presses for economical production of duplicate die inserts, multi-cavity molds, and intricate single cavities. Ask for your copy.

ELMES ENGINEERING WORKS of AMERICAN STEEL FOUNDRIES, 225 N. Morgan St., Chicago 7, Ill.  
Distributors in Principal Industrial Centers • Also Manufactured in Canada

METAL-WORKING PRESSES • PLASTIC-MOLDING PRESSES • EXTRUSION PRESSES • PUMPS • ACCUMULATORS • VALVES • ACCESSORIES



## *Controlled Hydraulic Pressure*

### with the ALDRICH-GROFF "POWR-SAVR" Pump

When it comes to maintaining constant hydraulic pressure in the operation of molding presses—you can pat yourself on the back if you've installed an ALDRICH-GROFF "POWR-SAVR" Pump.

Because—the "POWR-SAVR" maintains so constant a pressure that variance does not exceed 2% to 5% of that desired.

Take a look at the pressure chart above. It's an actual record of the hydraulic system at Parker Stearns & Company, manufacturers of rubber and plastics, in Brooklyn, N. Y.—and it shows the practically constant pressure that is maintained by the ALDRICH-GROFF Pump.

Furthermore, this constant pressure isn't the only feature. The installation, which consists of the "POWR-SAVR" and an Aldrich Centrifugal Pump for prefilling the hydraulic presses under low pressure, comprises a centralized hydraulic system that serves a large number of rubber molding presses. This simple system assures compactness, a minimum of investment expense, quick accessibility, easy maintenance and greater operating economy. It also affords ease in adjustment of hydraulic pressure to suit varying compounds and press requirements.

Write, today, for more information—or guidance on your hydraulic problems.



**THE ALDRICH PUMP COMPANY**  
6 GORDON STREET, ALLENTOWN, PA.

Representatives: Birmingham • Bolivar, N. Y. • Boston • Chicago • Cincinnati • Cleveland • Denver • Detroit  
Duluth • Houston • Jacksonville • Los Angeles • New York • Omaha • Philadelphia • Pittsburgh • Portland,  
Ore. • Richmond, Va. • St. Louis • San Francisco • Seattle • Spokane, Wash. • Syracuse • Tulsa



## THEY SAY IT'S WONDERFUL...

... not beauty contest judges, but the fine fellows who purchase armatures, flashlight cases, surgical and dental instruments and thousands of other plastic products from Michigan Molded. What's wonderful is the precision production, coupled with individual attention to each detail of each order for custom made plastics — injected, extruded or molded.

Not huge, Michigan Molded Plastics is just plain competent. It is large enough to have a capable staff, complete engineering services, modern, efficient facilities. Michigan Molded Plastics is small enough to appreciate each order, no matter the size.



**MICHIGAN  
MOLDED PLASTICS, INC.**  
*Dexter, Michigan*

*New* **MOLECULAR Scrubbing Action**  
**DISSOLVES DISPERSES**  
**From 25 MINUTES to 10½ HOURS *Faster***



## COWLES DISSOLVER

***A high-speed machine that develops  
high-velocity interface shear***

Turning at a rate of speed that dissolves or disperses from two to twenty times faster than the conventional mixer, the impeller of the Cowles Dissolver is scientifically designed to set up components of laminar flow. Each lamina, moving at a different rate of speed from its neighbors, creates interface shear between surfaces of molecular thickness. The multiple surfaces and high velocity gradients of these laminae subject every particle of the materials being treated to molecular tension and scrubbing, greatly accelerating the dissolving or dispersing action. Undissolved residues are held to low levels and more homogeneous mixtures are produced. Splash and dead spots are eliminated. Turbulence and aeration are held at low levels, though controlled aeration can be had if desired.

***Safe, Silent, Long-Wearing***

Sound design and rugged structure . . . plus finely machined materials of high physical properties . . . all assure maximum life with minimum maintenance requirements. A high degree of static and dynamic balance has been achieved in the rotating parts, eliminating noise, vibration.

***Models With or Without Tanks***

In two models—with built-in tanks in capacities of 100 gallons, 250 gallons and 500 gallons, or for use in tanks brought to the machine. Motor speed and horsepower adjusted to the need. Explosion-proof motors on special order. Write for descriptive folder, or ask for a technical representative to call.

**5 Years of Commercial Test Show Cowles Dissolver  
Up to 10½ Hours Faster on Typical Operations**

Type Operation	Material	Cowles Dissolver	Standard Mixer
Gum Cutting	Rosin	1½ Hrs.	12 Hrs.
Synthetic resin dissolving	Vynllite	1 Hr.	6 Hrs.
N/C solution	Nitrocellulose	12 Min.	90 Min.
Tinting	Enamel	5 Min.	30 Min.
Pigment dispersion	Heavy enamel	6 Min.	150 Min.
Coating suspension	H. T. Clay	1 Hr.	9 Hrs.

*The Cowles Company*  
INCORPORATED

Cayuga, N. Y. Associate: Alexander Fleck, Ltd., Ottawa, Ont.



## *The Feel of Quality*

- Molders who select Chemaco Ethyl Cellulose soon realize that this versatile plastic adds the feel of quality to items produced by the million.
- Our new formulations are producing brighter, better colors and an excellence of finish not possible heretofore, in addition to impact resistance and dimensional stability greater than that of any other cellulosic.
- Low specific gravity and recent price reductions mean more pieces per pound at lower cost.
- Through Chemaco Ethyl Cellulose, you can obtain for *your* mass production products the quality of a custom made article. Our technical knowledge and experience are at your service.
- Write for new folder listing characteristics of our powders.

Chemaco Corporation, Berkeley Heights, N. J. Branch office in Cleveland.



**ETHYL CELLULOSE PLASTIC MOLDING POWDERS**

Also Manufacturers of Cellulose Acetate and Polystyrene

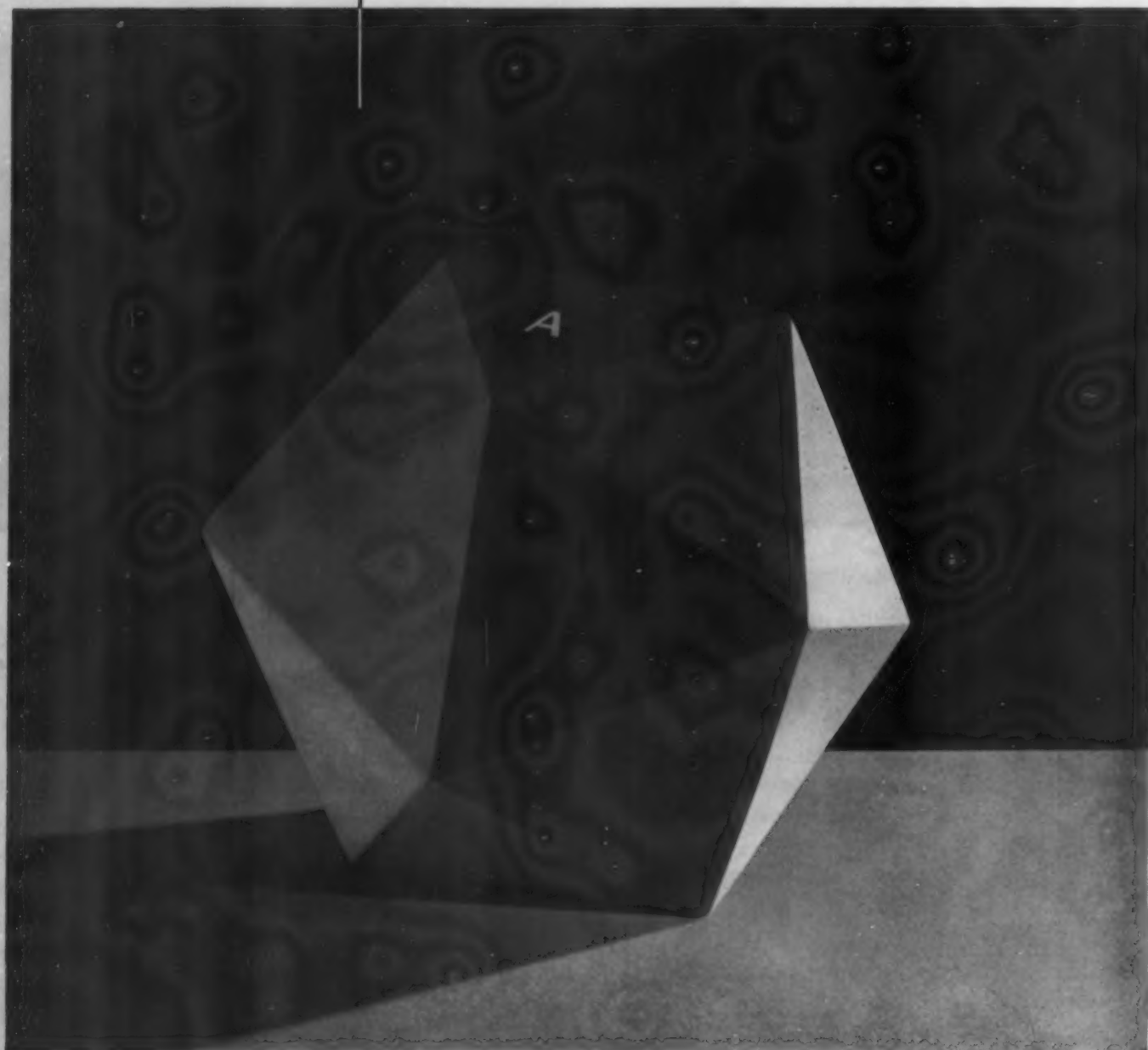
It tells when  
you will  
telephone

"It" is an icosahedron—a solid with twenty regular faces. The laws of probability say that if you roll a hundred icosahedrons on a table, eleven or more will come to rest with side "A" on top only once in a hundred throws.

Identical laws of probability rule the calls coming into your local Bell Telephone exchange. Suppose you are one of a group of a hundred telephone subscribers whose practice is to make one three-minute call each during the busiest hour of the day. The chance that

eleven or more of you will be talking at once is also only one in a hundred. Thus it would be wasteful for the Bell System to supply your group with a hundred trunk circuits. Eleven trunks will suffice to give you good service.

Telephone traffic conditions vary. But you can be sure, wherever you live, that Bell Telephone Laboratories research, which pioneered in applying probability theory to telephone traffic, is everywhere helping to make the most use of costly equipment.

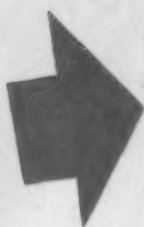


BELL TELEPHONE LABORATORIES



EXPLORING AND INVENTING, DEVISING AND PERFECTING, FOR CONTINUED IMPROVEMENTS AND ECONOMIES IN TELEPHONE SERVICE

**SAVE  
MONEY**  
*through reducing rejects*  
**INCREASE  
INCOME**  
*by increasing production*



## USE THE "DODGE" INSERT

### IT PREVENTS:

- floating inserts
- crushing of inserts
- retapping threads
- height tolerance difficulties
- breaking of mold insert pins
- cracking around inserts

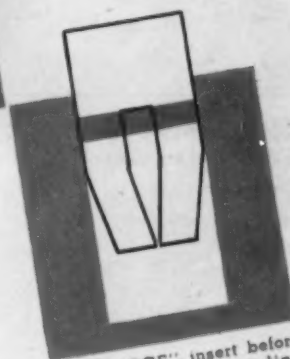
The "DODGE" expanding insert offers thermosetting and thermoplastic manufacturers a self-contained unit which will avoid many molding problems and save time and money on assembly.

The insert can be placed by hand or machine fed into drilled or molded holes—expanded with its own locked-in expanding washer—in less time than it would take to tap a brass insert. In thus reducing "open press" time the "DODGE" insert can be a valuable labor and money saver.

The special features of this insert may be the answer to your problems. For samples as well as prices and complete information, write us today. If you require special sizes not currently available, our Engineering Department will be glad to submit estimates.

**P**  
**THE HELPS MANUFACTURING CO.**

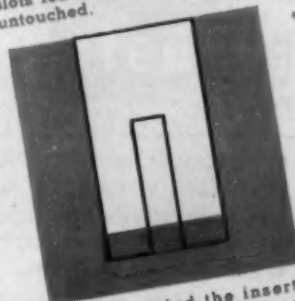
48 LEAVENWORTH STREET, WATERBURY, CONNECTICUT



The "DODGE" insert before expansion. The expanding washer in position as a complete unit.



The washer expands the insert by pressure against the slots leaving thread surfaces untouched.



Fully expanded the insert now has full thread surface available minus the width of the washer or  $1/32"$ .

Have you considered  
**TRIOXANE**  
 as a source of  
 Anhydrous Formaldehyde?



**H**ERE'S a new chemical which may solve some problems in organic synthesis, particularly those where yield and quality of product are of great importance. It is a formaldehyde

polymer—a special form of formaldehyde which may be used to carry out many reactions heretofore considered impracticable or impossible with formaldehyde or its usual polymers.

With Trioxane, unusual and profitable reactions are possible because:

1. It is readily soluble in most organic agents with the exception of paraffin hydrocarbons.
2. Of itself, it's an excellent solvent for many classes of materials, even at low temperatures.
3. It permits ready preparation of homogeneous non-aqueous reaction mixtures.
4. It's highly compatible in both neutral and alkaline non-aqueous solutions. Under these conditions, Trioxane acts like a stable, cyclic ether.
5. Stable systems containing Trioxane can be depolymerized to yield monomeric formaldehyde by the action

of acid catalysts or by pyrolysis.

6. The depolymerization or conversion of Trioxane to formaldehyde can be carried out at a controlled rate.

Trioxane thus can be used as a source for formaldehyde in reaction with phenols, substituted phenols, hydrocarbons, alcohols and amine hydrochlorides. In general, it is suitable for all types of organic reactions in which acidic catalysts are not incompatible with the reagents. For example, solvents are not required to carry out Mannich-type synthesis for the Trioxane acts as a solvent until it has been converted to formaldehyde and taken part in a desired reaction. The reaction mixture is thus converted quantitatively to the reaction product.

The properties of Trioxane suggest that it may have a wide variety of other industrial possibilities, e.g., as a plasticizer for other materials where its volatility is not objectionable.

### TRIOXANE

Cyclic trimeric polymer of Formaldehyde

#### PROPERTIES

Colorless, crystalline compound

Molecular Weight ..... 90.05

Odor ..... Mild, Pleasant

Melting Point ..... 61°C

Boiling Point ..... 115°C

Vapor Pressure

25°C ..... 13 mm

86°C ..... 283 "

114.5°C ..... 759 "

129°C ..... 1212 "

Flash Point (Open Cup) ..... 44°C

Density (molten) @ 65°C ..... 1.170

Solubility

Water ..... Readily Soluble

Alcohols ..... " "

Ketones ..... " "

Ethers ..... " "

Esters ..... " "

Chlorinated

Hydrocarbons... " "

Aromatic

Hydrocarbons... " "

Naphthalene ..... " "

Phenol ..... " "

Vegetable Oils ..... " "

Petroleum Ether... Slightly Soluble

**FOR TECHNICAL ASSISTANCE** and copies of Bulletin F-300-1146, which gives more information about Trioxane, write or call our nearest District Office. E. I. du Pont de Nemours & Co. (Inc.), Electrochemicals Department, Wilmington 98, Delaware.

**DISTRICT OFFICES:** Baltimore, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, El Monte, New York, Philadelphia, Pittsburgh, San Francisco.

**DU PONT**  
**ELECTROCHEMICALS**



BETTER THINGS FOR BETTER LIVING  
 ... THROUGH CHEMISTRY

## Time Presents a Strong Case for Plastics



When Consolidated-molded, the item illustrated satisfactorily met the following requirements:

- ✓ High surface polish
- ✓ Clean-cut fluting
- ✓ Rich, stable color
- ✓ Structural strength
- ✓ Lightweight
- ✓ Dimensional stability
- ✓ Precision molded slot to engage force-fit metal hinge assembly



**S**imple things, done well, are good teachers. They pave the way to more difficult things, done equally well—just as simply! Through experience and sound knowledge the good molder is able to organize simple procedures for each specific must. When the end-use function is known, the proper material selection is simple. When a high surface polish is desired without recourse to post-molding operations, a quality mold finish attains the objective . . . simply, economically.

Here in the above-shown case for plastics it was also necessary to incorporate a top-face slot which would securely anchor the manufacturer's specially formed, velvet-wrapped cover. This step, too, was simple—the accurate die construction producing a precision-molded opening permitted speedy assembly in one easy operation. Meeting the huge quantity requirements of so famous a watchmaker was simply a matter of designing a six-cavity mold for mounting in a press of suitable capacity.

The case for plastics always reduces to the simple one of "know-how" . . . the right material, in the right place, rightly used. Since 1874 Consolidated has practiced high quality custom molding. Our cumulative experience with all plastic materials and methods is your guarantee of moldings that are modern in design . . . properly processed . . . functionally correct. When your problem is one of plastics parts or products of precision and quality, the answer can be simple: Call Consolidated!

Larger illustration (upper left) shows plastic watch box frame as compression molded of urea formaldehyde by Consolidated Molded Products Corp. Above: Complete watch display case assembly as produced by Arrow Manufacturing Company, Hoboken, N. J., for the Bulova Watch Company's 21 Jewel "Excellency" Series.

**Consolidated**  
MOLDED PRODUCTS Corporation  
309 CHERRY STREET,  
SCRANTON 2, PA.

"Your  
Blueprint  
in Plastic"

Branches: NEW YORK, 1790 Broadway • CHICAGO, 549 W. Randolph St. • DETROIT, 550 Maccabees Bldg. • CLEVELAND, 4614 Prospect Av. • BRIDGEPORT, 211 State Street.  
PRODUCT DEVELOPMENT • MOLD DESIGN • MOLD CONSTRUCTION • PLUNGER MOLDING • TRANSFER MOLDING • INJECTION MOLDING • COMPRESSION MOLDING



"Where  
Can We Get  
**LESTER**  
Molded Products?"

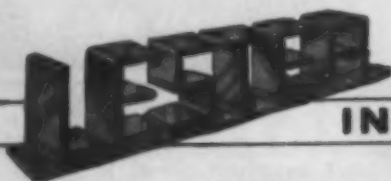


## THE BIG QUESTION AT CHICAGO

- Many of the thousands of visitors, who saw the LESTER injection molding machine in operation at the SPI show, asked, "Where can we get LESTER molded products?"
- The answer, "From LESTER'S customers"... and frankly, many of our customers have production capacity, design facilities and expert plastic know-how available right now. We agree with the article on **MERCHANDISING** in **MODERN PLASTICS** for May, which stated that merchandising and excess plant capacity constitute the "plastic industry's number one problem".
- A Solution for the problem... If you are in the market for molded plastics—ask us for the LESTER users list... It contains the names of hundreds of qualified plastic molders and a description of their equipment. Send for it today—and then ask several molders in your community for help with *your* problems. If you do this, you will help the entire industry solve its number one problem.

• This is the first of a series of Lester-Phoenix advertisements in the interest of our customers... the nation's best plastic molders.

NEW YORK  
CHICAGO  
LEOMINSTER  
CINCINNATI  
LOS ANGELES  
SAN FRANCISCO



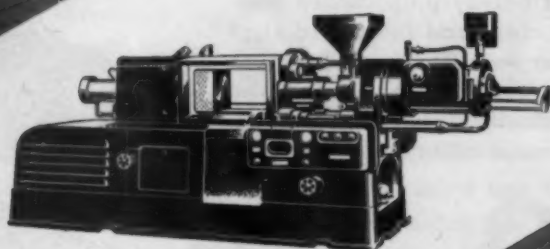
## INJECTION MOLDING MACHINES

Distributed by **LESTER-PHOENIX, INC.**  
2621 CHURCH AVE., CLEVELAND 13, OHIO

## SPECIFICATIONS

## WHICH PROCESS

should we use  
for your moldings?



"It makes little difference," you say, "so long as each finished piece fulfills your requirements in strength, dimensions, appearance and so on."

But it's to your advantage that we don't feel that way at Norton.

Our design engineers and technicians, working with your men or direct from your blueprints, are mindful of molding "habits" that may make a material best suited for the application in hand... possibilities for improvement through minor design changes... and the potentials of each molding technique.

So in terms of your satisfaction,

it makes a *lot* of difference to Norton which process is used. And with more than 20 years of experience in fine custom plastics molding... injection and compression... we have learned the advantages and the limitations of each process.

Whether you are now contemplating your first adventure in

plastics, or are an old hand at the business, Norton has a method of approach and a plant set up you can use.

These factors mean efficiency and economy in the long run... on the short one too. Why not write us? Norton Laboratories, Inc., Lockport, N. Y.

# NORTON *Laboratories, Inc.*

COMPRESSION AND INJECTION MOLDING

→ IMMEDIATE PRODUCTION — Our facilities now permit production on new orders without delay.

## Have you ever thought of using a "German" for mixing or preblending?



### WHAT IS A GERMAN MIXER?

This machine consists essentially of a rotor enclosed in a cylinder made in halves. The cylinder is jacketed for steam circulation and is provided with an alloy steel liner, also made in halves.

In operation, the stock is drawn into the cylinder by a fluted scroll at the feed end of the rotor, which extends through the cylinder and is supported by anti-friction bearings. The rotor is equipped with tool steel knives and spacers and the liner has tool steel stationary teeth to provide dual cutting action.

After the stock has been worked in the chamber, it is extruded through perforations in a plate fastened to the cylinder head and is then cut off by a knife fixed to the rotor outside the perforated plate.

To withstand strenuous service, the German mixer is strongly and durably built with heavily proportioned Meehanite castings and fabricated steel stringer supports. The formula for the extremely wear-resistant liner of the cylinder was developed in the Farrel-Birmingham metallurgical laboratory.

### WHAT IS THE MACHINE'S HISTORY?

The German mixer has been used successfully for a great many years in the linoleum industry for finish mixing after the mix has received a preliminary treatment in a Banbury. During this time Farrel-Birmingham has made many improvements in the machine which have paved the way for its use in processing plastic compounds of all types.

### WHERE CAN YOU GET MORE INFORMATION?

Farrel-Birmingham engineers will be glad to discuss the possibility of adapting this machine to fit your processing needs. Why not call on them? No obligation, of course.

### FARREL-BIRMINGHAM COMPANY, INC.

ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N.Y.

Sales Offices: Ansonia, Buffalo, New York, Boston, Pittsburgh, Akron, Chicago, Los Angeles, Tulsa, Houston.

### F-B PLASTICS MACHINERY

Banbury Internal Mixers  
Roll Mills  
Converting, Mixing and Sheetting Rolls  
Calenders  
Plasticating Machines  
Extruding Machines  
Hydraulic Presses  
Hydraulic Accumulators  
Sheet Cutters or Planers



*Farrel-Birmingham*

FB-409

ANNOUNCING  
a new plant  
for production of

**"FLEXOL" TOF**

TRADE-MARK

TRI-2-ETHYLHEXYL PHOSPHATE



"Flexol" plasticizer TOF effectively produces compositions having these four desirable properties:

1. Excellent low-temperature flexibility.
2. Minimum change in flexibility over a wide temperature range.
3. Resistance to water extraction.
4. Low volatile loss.

A new plant unit for the production of "Flexol" plasticizer TOF is now in operation. If your product is a resin coating, or a molded, calendered, or extruded composition it will be worth while to investigate the properties of this new and unusual plasticizer.

"Flexol" TOF imparts unusual low temperature flexibility to plasticized compositions without sacrificing compatibility, resistance to water extraction or permanence. TOF is readily compatible with the vinyl resins commonly used in the production of unsupported film or coated cloth. Laboratory tests indicate that this plasticizer is also fully compatible with ethyl cellulose and yields a composition having high impact resistance. TOF is an excellent plasticizer for neoprene and nitrile type synthetic rubber especially where low temperature flexibility is required.

Write or call our nearest office for technical data on this and other plasticizers we supply, please address Dept. L-7.

COMPATIBILITY OF "FLEXOL" PLASTICIZER TOF WITH VARIOUS RESINS

Resin	Ratio of Resin to Plasticizer		
	1:1	4:1	9:1
"Vinylite" Chloride-Acetate Resin VYNW...	C	C	C
"Vinylite" Chloride-Acetate Resin VYHH..	C	C	C
"Vinylite" Butyral Resin XYNC.....	C	C	C
"Vinylite" Acetate Resin AYAT.....	I	I	I
"Geon" 100 Series.....	C	C	C
Cellulose Nitrate.....	C	C	C
Cellulose Acetate.....	I	SI	SI
Cellulose Acetate-Propionate.....	SI	C	C
Cellulose Acetate-Butyrate.....	I	SI	C
Ethyl Cellulose .....	C	C	C

C—Compatible

I—Incompatible

SI—Slightly Incompatible



**CARBIDE AND CARBON CHEMICALS CORPORATION**

Unit of Union Carbide and Carbon Corporation



30 East 42nd Street, New York 17, N. Y. Offices in Principal Cities  
Distributed in Canada by Carbide and Carbon Chemicals, Limited, Toronto

The words "Flexol" and "Vinylite" are registered trade-marks of Carbide and Carbon Chemicals Corporation.



**THIS  
SERVICE**

## **CUSTOM FITS PLASTICS TO YOUR NEEDS**

- We are prepared to work with your organization through all phases of a molded plastics application—from preliminary discussion and research to design development, molding and finished assembly.
- Our objective is to help you find the most practical plastics application for your products; to determine *how* and *where* plastics should be used.
- We recommend the plastic material best suited to your requirements—to add strength, attractiveness, insulating properties, comfort-in-use, color appeal or other desired qualities.
- Our equipment is the most modern type for injection, transfer and compression molding. We are experienced in precision molding to extremely close tolerances, and have facilities for high speed, volume production.
- One of our specialties is molding plastics in combination with complementary metals.
- Working closely with engineering departments of plastics users, we have developed new molding techniques and unusual plastics applications. Let us discuss your products and how they may benefit further from plastics.
- For additional information on our services write for Catalog Folder MP-7.



## **PLASTIC MANUFACTURERS**

**INCORPORATED  
STAMFORD, CONNECTICUT**

**INJECTION, TRANSFER & COMPRESSION MOLDING • COMPLETE ASSEMBLY**

Representatives: NEW YORK CITY—19 West 34th Street • DETROIT, MICH.—805 New Center Building

LOS ANGELES, CAL.—1440 S. Robertson Blvd.

CANADA—David C. Orrock & Co., 1405 Bishop St., Montreal



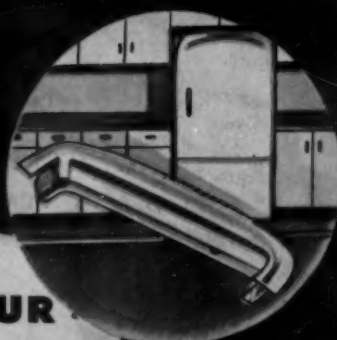
Washing machine agitators

Plumbing fixtures



Automobile instrument panels

IF IT'S A **BIG** PLASTIC PART...GENERAL AMERICAN CAN BUILD IT BETTER!



Refrigerator door trim

**YOUR  
PRODUCT  
?**

An impressive battery of the world's largest injection molding presses



General American has the engineering skill, the creative imagination, and the equipment to manufacture large and complex plastic parts.

Waiting to serve you at General American are batteries of large volume injection molding presses, including the 32-oz. type, and compression presses ranging up to 500-ton, 1000-ton and 2000-ton capacities. That means volume—a smooth flow of plastic parts to your production line.

Submit your plastics problems to us for design, engineering and prompt quotations.

**PLASTICS DIVISION  
GENERAL AMERICAN TRANSPORTATION  
CORPORATION**  
135 South La Salle Street • Chicago 90, Illinois

# Wheelco Customers— the “Blue Book” of American Industry



Thousands of satisfied users are applying Wheelco Equipment to their modern manufacturing processes. For fast and accurate Temperature Indication and Control—for dependable Combustion

Safeguard—for immediate delivery from stock of Instrument Systems, Accessories and Auxiliaries write to: Wheelco Instruments Company; 875 W. Harrison St., Chicago 7, Illinois.

A76

## WHEELCO *Electronic* CONTROLS



# NIAGATHAL W

Tetrachloro phthalic anhydride. Approx. 50% chlorine

Products in which tetrachloro phthalic anhydride has been used

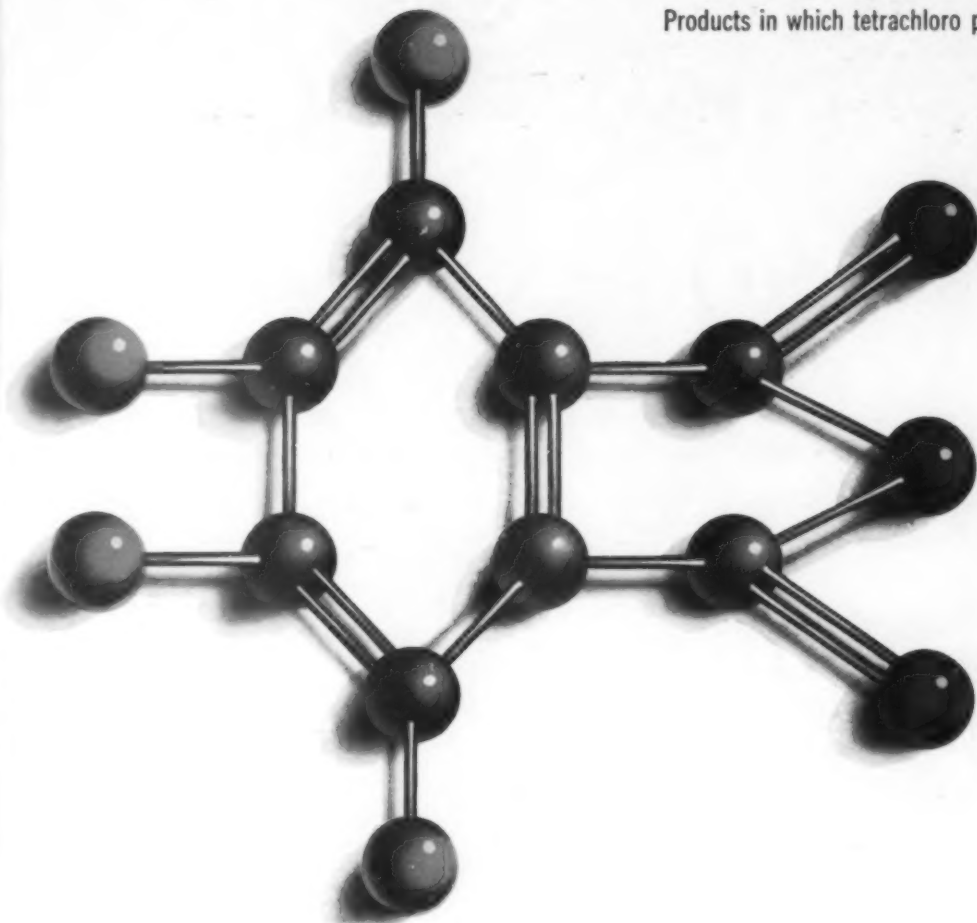
## DYES AND INTERMEDIATES

Types:

anthraquinone  
benzoylbenzoic acid  
fluorescein  
indigo  
phenolphthalein

Esters for ...

Insulating materials  
Lubricants  
Pharmaceuticals  
Plasticizers  
Protective coatings  
Synthetic resins



## NIAGATHAL A

Tetrachloro phthalic acid hydrate

- Reacts more readily with alcohols and bases
- Greater solubility in some organic solvents
- ★ Available in experimental quantities

An Essential Part of America's Great Chemical Enterprise

**NIAGARA ALKALI COMPANY**

60 East 42nd Street, New York 17, N. Y.

Caustic Potash • Caustic Soda • Paradichlorobenzene • Carbonate of Potash  
Liquid Chlorine • Niagathal (Tetrachloro phthalic anhydride)

Write for full details and samples

NIAGARA ALKALI COMPANY  
60 East 42nd Street  
New York 17, N. Y.

Send to my attention, sample quantities of Niagathal W\_\_\_\_,  
Niagathal A\_\_\_\_. Send me Technical Bulletin on Niagathal\_\_\_\_.

Name\_\_\_\_\_Title\_\_\_\_\_

Company\_\_\_\_\_

Address\_\_\_\_\_

# Specialized Audiences for Your Advertising and How to Reach Them

TO keep abreast with constantly changing conditions and new developments in the fields of industry, science and the arts, forward-looking men and women read business papers and professional journals. In addition to the editorial content, the informative advertising in these publications is today a major source of factual news and helpful working material.

Advertising in business papers makes it possible to reach specialized audiences with specialized messages. In order to select the right media and to adapt messages to the interests of the subscribers, advertisers need the information in A.B.C. reports. Paragraph 10 in these reports, for example, gives a breakdown of the paid subscribers by occupation or business. Other

questions essential to successful business paper advertising and answered by the information in A.B.C. reports: How much paid circulation? How much unpaid? How was circulation obtained? What do people pay for it? How many subscribers are in arrears? What is the renewal percentage? Where does the circulation go?

With the answers to these questions, advertisers are in a position to evaluate media and to write advertising of interest to the specialized groups that receive the publication. Always make A.B.C. reports your starting point in buying advertising space. This paper is a member of the Audit Bureau of Circulations. Ask for our A.B.C. report and then study it.

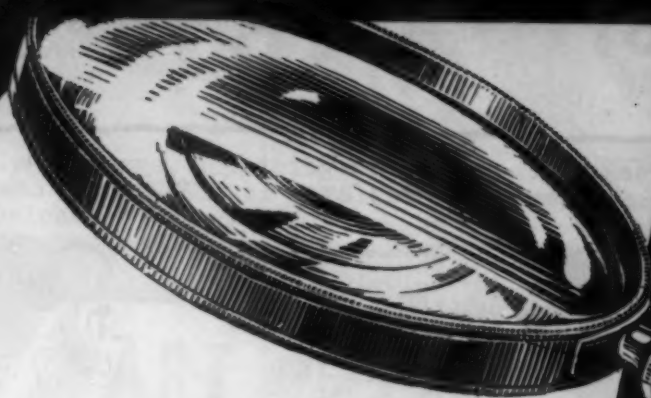


## SEND THE RIGHT MESSAGE TO THE RIGHT PEOPLE

Paid subscriptions and renewals, as defined by A.B.C. standards, indicate a reader audience that has responded to a publication's editorial appeal. With the interests of readers thus identified, it becomes possible to reach specialized groups effectively with specialized advertising appeals.

## MODERN PLASTICS

**ABC** = AUDIT BUREAU OF CIRCULATIONS = *Facts as the Basic Yardstick of Advertising Value*



## THE CASE *of the* SKY-RIDING SPIGOT

*held no mystery  
for us*

—as is evident from the delight of airlines hostesses with the smooth operation and beauty of the new Harrington Manufacturing Company buffets. Satin black and brilliant red plastics on stainless steel contrast superbly with the aluminum background of the buffets in America's newest planes. Whether your need is a simple knob, bushing, or an elaborate housing, have Creative show you how to use plastics to your best advantage.

*Plastics Specification Quiz:* If it's not convenient for you to send blueprints or samples, write for our "Plastics Specification Quiz". Two minutes with this Quiz will enable you to tell us which of your products may be improved by the use of plastics.



*Creative*  
**PLASTICS CORP.**  
960 KENT AVENUE • BROOKLYN 5, N.Y.





When your wife shops for Saturday's snack, does she say, "A can of baked beans, please"? Certainly not!

She asks for a *brand* by name, and even if she hasn't tried the particular product, she has confidence in the name behind it.

Such shopping is considered a "must" by the housewife. Why shouldn't you do the same when you're looking for molded plastic parts?

So, take a leaf out of your wife's shopping book and **LOOK AT THE NAME BEHIND THE CONTRACT.**

*Molded at Boonton Means Good Plastic Molding*



FOR OVER 25 YEARS  
CUSTOM ENGINEERS  
OF MOLDED PLASTICS

**BOONTON MOLDING COMPANY**

MOLDERS OF MOST PLASTICS BY MOST METHODS

**122 EAST 42nd ST., NEW YORK 17 •**

SUITE 1716-M  
MURRAY HILL 6-8540

FACTORY—BOONTON, New Jersey

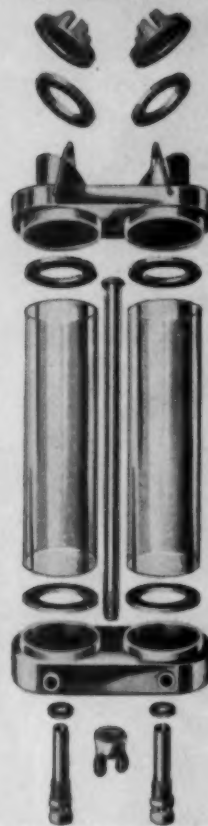


"This advertising message, appearing in 4-color cover position in **NEWSWEEK**, **BUSINESS WEEK** and **U. S. NEWS**, is developing business for Monsanto Lustron molders and fabricators."

# ONE PART INSTEAD OF TWENTY

WITH

**Lustron**  
A MONSANTO PLASTIC



A switch to Monsanto Lustron for your material may cut your manufacturing costs, eliminate many operations, speed production. In the typical case of this milking machine head, one plastic molding eliminates 4 brass castings, 2 wire hangers, 2 pieces of glass, 6 pieces of rubber, 2 screws, 2 washers, 1 nut and bolt, and valuable hours of assembly time.

In addition, Monsanto's versatile polystyrene molds readily in the fastest mass production techniques. All waste is salvageable at full value and light weight plus low cost per pound gives more items per material dollar. Expensive

finishing operations are eliminated, too. This versatile Monsanto polystyrene comes in a rainbow range of colors—clear and opaque, offers low temperature strength, high dimensional stability, excellent electrical qualities, freedom from taste and odor, and excellent resistance to alkalis, acids and water.

**MONSANTO**  
CHEMICALS — PLASTICS

You can pick up speed, new performance qualities and more profits for your product the Monsanto Lustron way. Monsanto plastics engineers will guide you. Write direct: **MONSANTO CHEMICAL COMPANY**, Plastics Division, Springfield 2, Mass. In Canada: **Monsanto (Canada) Limited**, Montreal.

The broad and versatile family of Monsanto Plastics includes: Lustron® polystyrenes • Cerex® heat resistant thermoplastics • Vinyls • Nitron® cellulose nitrates • Fibestos® cellulose acetates • Thalid® resin • Resinox® phenolics • Resimene® melamines • Forms in which they are supplied include: Sheets • Rods • Tubes • Molding Compounds • Industrial Resins • Coating Compounds • Continuous Films • Vupak® rigid, transparent packaging materials. Saflex® safety glass interlayers.  
Reg. U. S. Pat. Off.

SERVING INDUSTRY...WHICH SERVES MANKIND

# use **DISSTON** MOLD STEELS



- for
- PRODUCTS OF ALL SHAPES AND SIZES
  - EASY HOBGING AND MACHINING
  - SMOOTH, CLEAN CAVITIES
  - MAXIMUM ECONOMY

Whatever the nature of your plastic product or the molding process used, you will find that one or more of the three fine-grained Disston Mold Steels will meet your needs exactly.

Each Disston Mold Steel is made of carefully selected materials, in electric furnaces, by modern steel practice with every process under rigid control. Each is uniformly sound, carburizes evenly and produces smooth, clean cavities.

**DISSTON PLASTIRON** is a low carbon iron that withstands extreme hobbing. Recommended for difficult shapes and short runs.

**DISSTON PLASTALLOY** is a low carbon steel with the right amount of nickel and chrome to assure great core strength and wear resistance, yet permit easy hobbing. Recommended for medium runs.

**DISSTON PLASTIKUT** is a "cut mold" steel with alloy content for maximum core and case strength. Because of its great strength, Plastikut requires machining. But its ability to stand up under long runs makes its use economical.

**WRITE FOR FOLDER**—tells what to look for and what to avoid in selecting mold and hob steels. Contains analyses of Disston Mold and Hob Steels and other data.

**DISSTON METALLURGISTS AND ENGINEERS WILL BE GLAD TO HELP YOU GET THE MOST FROM YOUR MOLD AND HOB STEELS.**



**STEEL**—Everybody who wants to obtain steel can help himself to get it by immediately starting scrap into the channels that serve steel mills.

**HENRY DISSTON & SONS, INC., 734 Tacony, Philadelphia 35, Pa., U.S.A.**

**DISTRIBUTORS**  
NEW ENGLAND  
**ACHORN STEEL COMPANY**  
381 Congress Street  
Boston 13, Mass.

METROPOLITAN NEW YORK AND NORTHERN NEW JERSEY  
**BRIGHT STEEL CORPORATION**  
Offices and Warehouses: 528-540 W. 22nd St., New York 11, N. Y., and  
224-236 Culver Ave., Jersey City 3, N. J.

# THE MODERN PLASTICS ENCYCLOPEDIA

*The Only Book Of Its  
Kind In The World*

There are any number of ways you can find out about plastics—but the quickest and surest way is to have a copy of the new 1947 MODERN PLASTICS ENCYCLOPEDIA.

If you want to find out how to adapt plastics to new jobs, how to improve products with plastics, or if you want to find out what plastics can do, then you should have a copy of the MODERN PLASTICS ENCYCLOPEDIA. If you are interested only in ideas, techniques, services, equipment, raw materials, or the chemistry of plastics, you can use a copy of the MODERN PLASTICS ENCYCLOPEDIA. You will find that this book will put you years ahead in experience and knowledge.

## THE SUBSTANCE

The information in the MODERN PLASTICS ENCYCLOPEDIA is not available through any other single source. When you have questions about materials, coatings, films, fibres, fabrics, laminates, resin-wood products, the answers can be found in the MODERN PLASTICS ENCYCLOPEDIA. When you have questions about engineering, molding, fabricating, or machinery, the answers can be found in the MODERN PLASTICS ENCYCLOPEDIA. If you have questions about the properties of fibres, low-pressure laminating resins, adhesives, plasticizers, solvents, plastics properties, plastics identification, formulae of resins and synthetic rubber, and plastics coatings, the answers can be found in the MODERN PLASTICS ENCYCLOPEDIA. Ten especially prepared large charts help carry the data. The directory section, also available in separate

form, is the most complete index available on machinery manufacturers, molders, fabricators and laminators, material suppliers, moldmarks, tradenames, etc. The directory section is used constantly by members of the industry because it really tells where to buy.

## IT'S AUTHENTIC, TOO!

Basic information for the MODERN PLASTICS ENCYCLOPEDIA is secured from hundreds of individuals who are acknowledged authorities on various phases of plastics. Every article is checked with other authorities in the same field to make sure the articles are balanced, free from error, opinions, or bias. Furthermore, an editorial staff of eleven works more than a year in digging, and digging, and digging for information. The result is real substance—in quality and quantity.

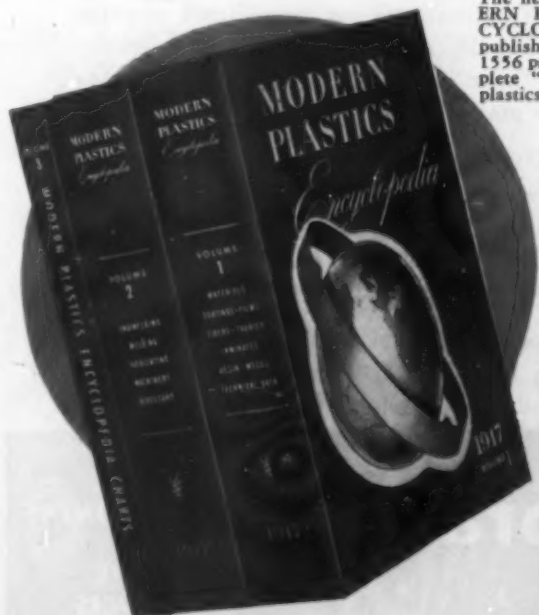
## LOTS OF PICTURES

More than just a reference book, the MODERN PLASTICS ENCYCLOPEDIA is a book of new ideas. The 899 illustrations in the editorial section alone add to the attractiveness of the presentation. Many pictures show how-to-do steps in making plastic products. The four-color advertising illustrations show hundreds of brilliant new uses of plastics.

## ORDER YOUR COPY NOW

The 1947 edition has just been published, and while there are 20,000 copies printed, almost half of these are already bought and paid for. This is a rough indication of the demand for this encyclopedia. So if you want to be sure you have your set, fill the order form below and mail immediately with your remittance. It will prove to be one of the best investments you can make—Price \$8.50 per set U.S., \$11 in Canada including postage and duty, and \$12 foreign. Better hurry, these books move fast.

The new 1947 MODERN PLASTICS ENCYCLOPEDIA just published. Contains 1556 pages. The complete "know-how" of plastics.



MAIL YOUR ORDER NOW!

**PLASTICS CATALOGUE CORP.**  
122 E. 42nd St. • New York 17, N. Y.

Gentlemen:

Please rush my copy of the new 1947 MODERN PLASTICS ENCYCLOPEDIA. Remittance is enclosed for \$.....covering..... complete set (or sets). Price \$8.50 prepaid in U. S., \$11.00 per set in Canada, including duty and postage, \$12.00 per set foreign.

Name.....

Company.....

Address.....

City..... Zone..... State.....

Your Position.....

Please be sure to enclose remittance with your order.

# We can begin with your idea...



engineer it ... produce it ... assemble and ship ... large or small production runs in one of the world's best-equipped plastics plants.

## consult Celluplastic

### for EXTRUSION or INJECTION MOLDING!

#### WRITE or TELEPHONE

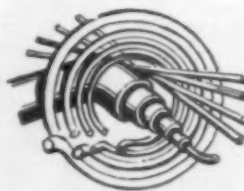
*New York Office:*  
Rockefeller Center  
630 5th Avenue  
Phone: Circle 6-2425

*West Coast Office:*  
Container Service Co.  
Los Angeles 27, Calif.

#### AMERICA'S #1 SOURCE FOR PLASTIC CONTAINERS

Seamless • All Colors  
Shaped to suit your product  
in all thermoplastics

- We handle every thermoplastic
- Unusual and standard extruded shapes
- Injection molding up to 22 ounce capacity
- Engineering staff at your service—plastics specialists since 1919
- Varied equipment enables us to make large or small runs efficiently, economically
- Monofilament, webbing, rods, tubes—products for industrial use or retail sale



## Celluplastic Corporation

50 AVENUE L, NEWARK 5, N. J.

PLASTIC  
CONTAINERS  
and  
PLASTIC  
PRODUCTS



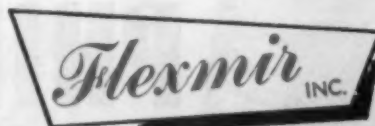
Flexmir's metallizing techniques include the finishing or plating of every known non-conductive material in all colors including gold, silver and antique. Fabricators are constantly finding new adaptations for our clear, colored and antiqued mirrors. Flexmir's unbreakable mirrors are obtainable in maximum size sheets 20" x 50" or less, and they can be cut as easily as clear plastic.

The brilliant and uniform quality of our colored metallized acetate rolls and sheets, are the result of Flexmir's latest advances in this highly technical field . . . the beauty and durability of our metallic plating on plastics, glass, ceramics, etc., an added assurance for increasing the saleability of your products.

Check with Flexmir's creative ideas for your finishing or fabricating needs! Flexmir, a service organization, will gladly discuss your problems with you and aid you with impartial and beneficial advice.

Write for  
**FREE**  
Brochure

**PIONEERS IN METALLIZING PLASTICS**



20-28 BROOME STREET NEWARK 3, N. J.

**JULY • 1947**

**45**

# It's a Joy Ride for Automakers

(FOR DRIVERS AND PASSENGERS, TOO)



**...with AMERICAN PHILLIPS SCREWS**  
that keep brakes on costs, protect performance, speed up sales

**"STEP ON THE GAS" IN PRODUCTION!** Why put up with slow, slip-and-slash, "horse-and-buggy" fastening methods when AMERICAN PHILLIPS SCREWS can be driven at TOP SPEED. But speed is only part of the story. American Phillips Screws can't be fumbled, fingers can't be mangled, work can't be wrecked. And driving is automatically straight. So . . . TOTAL TIME-SAVINGS MOUNT AS HIGH AS 50%.

4-WINGED DRIVER CAN'T SLIP OUT  
OF PHILLIPS TAPERED RECESS

**"STEP ON THE GAS" IN PROMOTION!** American Phillips Screws give car, boat, appliance (or whatever you make), a "classy chassis" that means more sales thru more showmanship! Clothes and hose can't snag. And resistance to vibration makes another talking point. There's an American Phillips Screw in any type or metal which will win these production and promotion "extras" for you, your distributors and dealers.

**AMERICAN SCREW COMPANY, PROVIDENCE 1, RHODE ISLAND**  
Chicago 11: 589 E. Illinois Street      Detroit 2: 502 Stephenson Building

# AMERICAN PHILLIPS *Screws*



**ALL TYPES**  
**ALL METALS:** Steel,  
Brass, Bronze, Stain-  
less Steel, Aluminum,  
Monel, Everdur (sil-  
icon bronze)

IT'S A GREAT TEAM!

# GERITY-MICHIGAN DIE CASTINGS

PLUS PLASTICS

More and more parts and products today combine die castings and plastics... for *smarter styling plus greater economy and utility!*

For example, this horn ring consists of an intricate die casting with chrome finish produced by Gerity-Michigan. A colorful plastic part is added at our plant before shipment.

At Gerity-Michigan, you get highly efficient one-source service for die castings—unfinished or finished in chrome, nickel or silver. Ideal source for parts die cast to specifications for automotive, refrigeration, novelty, clock, appliance and other industries. Write to Gerity-Michigan Die Casting Co., Adrian, Mich.

*Gerity-Michigan*

FINISHED OR UNFINISHED  
DIE CASTINGS



Tooling the most intricate moulds for the most complex moulding problem is another of the services we offer the plastics user.

For moulds that consistently turn out dependable plastic parts or products in any plastic process . . . think of Bridgeport.

**BRIDGEPORT MOULDED PRODUCTS, INCORPORATED**

BRIDGEPORT  CONNECTICUT



# Talk about Record Sales TO "END" USERS!



**W**ATERPROOF baby pants are just one of the end uses where RESPROID is breaking sales records. All over the country this modern vinyl plastic is making friends—and profits—with its beauty and practicality. Whether you want new products to make or new ways to improve your present lines, RESPROID offers you a whale of an opportunity!

Manufactured in a wide variety of lovely styles—pliable, unsupported films, wear-resistant plastic coated fabrics and extruded shapes—RESPROID is ideal for shower curtains, upholstery, luggage, aprons, water-

proof garments, ladies' belts—a range of products as limitless as your own imagination.

RESPROID is made to resist cracking, fading, scuffing and abrasion—is unaffected by all the normally destructive factors of everyday use.

RESPROID comes in a rainbow of jewel-like colors and pastel shades—colors that are perfectly practical because RESPROID can be cleaned in seconds with just a damp cloth.

RESPROID adds up to a lot of very profitable business for you. Right now's the time to cash in on its fast growing popularity.

● Manufactured in a modern, fully equipped factory under strict laboratory control, **Resproid** is compounded of high molecular weight resins which can be processed only on the latest plastic equipment and which give greatly increased wearing qualities. Insist on the name **Resproid** when you buy.





## NEW ORLEANS INVITES THE PLASTICS INDUSTRIES

### A NEW ORLEANS LOCATION MAKES SENSE...and PROFITS!



**TRADE FACILITIES...**unequaled. New Orleans International House (above) and International Trade Mart (below) aid in your buying-and-selling with Latin America and the world. The new Foreign Trade Zone gives you competitive advantages in manufacturing, exporting, and importing.



**HERE ARE MARKETS...**New Orleans is strategically located to serve two great manufacturers' markets—the rich Mid-Continent area and the fast-growing 10-states Southern market, whose effective buying income has more than doubled in 5 years—and a vast, buy-minded export market comprising all South and Central American republics, Mexico and the Caribbean area.

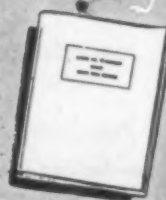
**HERE ARE RAW MATERIALS...**in abundance. Cotton, cotton linters, soy beans, wood pulp, soda ash, bagasse, petroleum, and their thousands of derivatives—cellulose, lignin, the acids, carbon black, etc.—all are produced within city limits or just a few miles beyond. Imported through the great port of New Orleans are casein, castor beans and other materials indispensable to the manufacture of plastics—available here without additional transportation expense.

**HERE IS TRANSPORTATION...**with a combination of facilities unequalled elsewhere. Modern, sheltered har-

bor, 97 ship and barge lines, 9 trunk railroads, 8 major airlines, well-kept highways, a 13,000 mile network of inland waterways. **LOW COST FUEL...**unlimited; natural gas from fields near New Orleans; abundant, economical electricity from gas-fired steam power plants. **SKILLED LABOR...**plentiful, intelligent, cooperative. New Orleans' permanent labor supply has more than doubled since 1940. **FRIENDLY TAXATION**, local and state, encourages industrial growth. Investigate now.

#### LET US SEND YOU FREE

a copy of our recently completed study, "Manufacturing Opportunities in Plastics in New Orleans." Write:



Greater New Orleans, Inc., 1024 Maison Blanche Bldg., New Orleans 16, La.

**GREATER NEW ORLEANS**





WE *Captured* A BEAM OF LIGHT



ANOTHER IN A SERIES OF  
*Case Histories*  
IN WHICH  
FELSENTHAL TAKES IT  
FROM BLUEPRINT TO  
PRODUCT IN PLASTIC

... WITH A MOLDED RADIUS  
AND TWO PATCHES OF PAINT



Motorola's glass dial was beautiful, but light leaking out the edges lit up the front of the radio set while not enough came through the dial face for legibility.

The problem posed to Felsenthal engineers, therefore, was to "capture" the runaway light, preventing it from leaking, and concentrating it in the center of the dial.

As our first step, we redesigned the unit with a radius around the ends to prevent dissipation of light. Secondly, we put opaque paint within the knob-holes on the surfaces nearest the ends of the dial.

Thus light entering the knob-holes from the rear could flow only through the unpainted inner surfaces of the holes into the face of the dial where it was wanted.

Injection molded of acrylic and silk-screened, this dial is another gratifying result of the kind you can expect from Felsenthal when YOU bring us your special molding or fabricating problem. Why not do it today?

Ask, on your letterhead for our NEW booklet No. 7  
" FELSENTHAL PLASTICS "



**FELSENTHAL PLASTICS**

INJECTION MOLDING • LAMINATING • FABRICATING

G. FELSENTHAL & SONS

4120 W. GRAND AVE. • CHICAGO 51, ILL.

# THE



# CHAMP

Heats 6 Pounds (96 ozs.) in ONE MINUTE

*That's Performance  
in Preheating Equipment*

Whenever you see the THERMALL Diamond on an HF Heating Unit, you can bet your last dollar on the utmost in performance.

We'll gladly give you technical and engineering data about every size THERMALL Unit. Users say that we are conservative in our power ratings. They tell us that THERMALL HF Heating Units consistently deliver more than rated power; preheat faster than we claim.

Time after time, users have said they were "amazed at THERMALL performance."

If you have a pre-heating or molding problem of any kind and want technical advice or assistance—write us. We will assist you by assigning one of our technical representatives to your problem without obligation.

When you want a job done day in—day out, remember that

**THERMALL means PERFORMANCE**



*The THERMALL CHAMP* occupies only 20 x 30 inches of your floor space. Heats 96 ounces compound to molding temperature in 1 minute. Completely portable.

Bulletin P7 gives specifications and details of all THERMALL HF Units. It's free, on request

**W. T. LAROSE & ASSOCIATES**

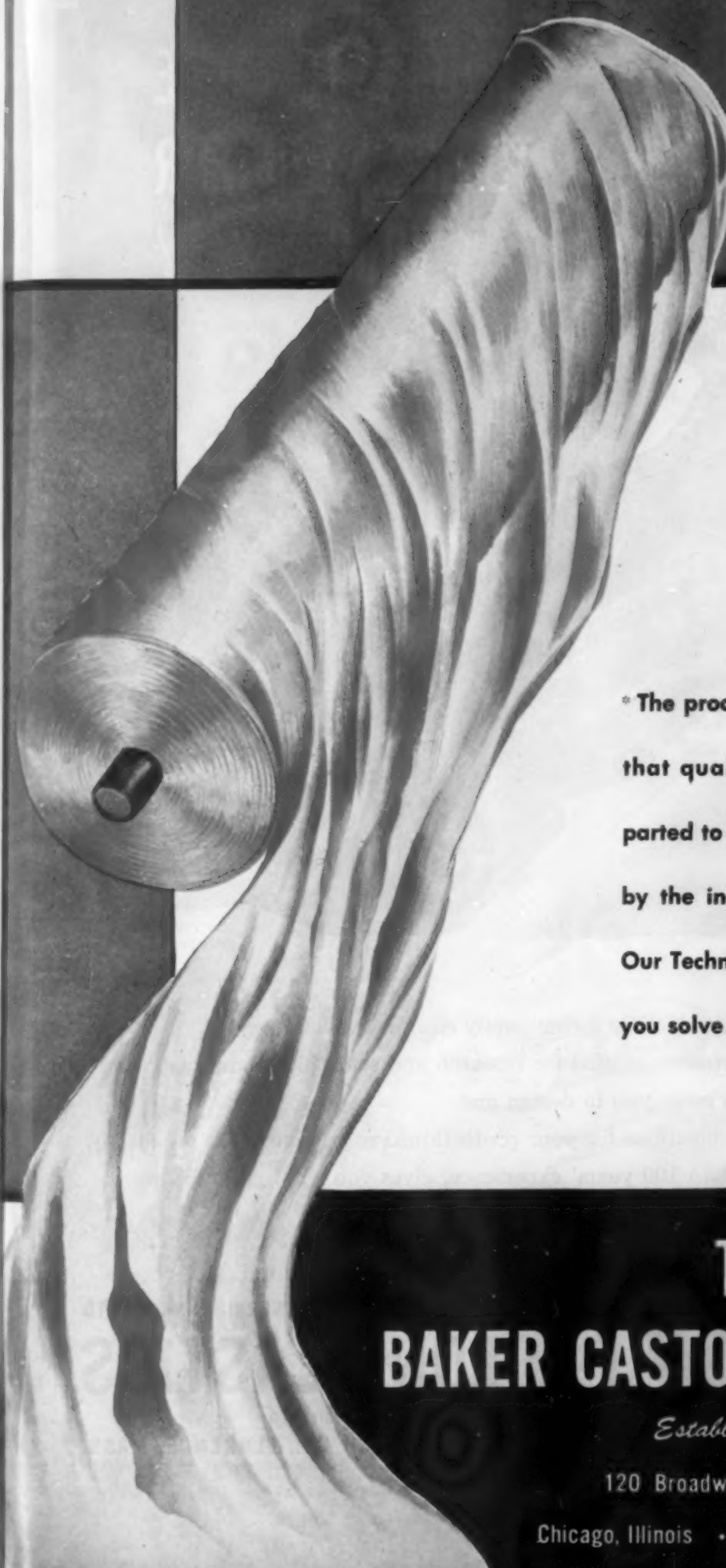
635 Second Avenue

Troy, New York

Representatives in All Principal Cities

Export: Omni Export Corp., 40 East 34th St., New York 16, N. Y.

... the proof of the Plasticizer  
is in the  
**DRAPE\***



\* The proof of the plasticizer is in the DRAPE —  
that quality of hang, softness, "hand", im-  
parted to unsupported films and coated fabrics  
by the incorporation of BAKER PLASTICIZERS.  
Our Technical Service Staff will be glad to help  
you solve your plasticizer problems.

**THE  
BAKER CASTOR OIL COMPANY**

*Established 1857*

120 Broadway, New York, N. Y.

Chicago, Illinois • Los Angeles, California



**WHERE TO COME  
TO GET MORE FOR  
YOUR MONEY**

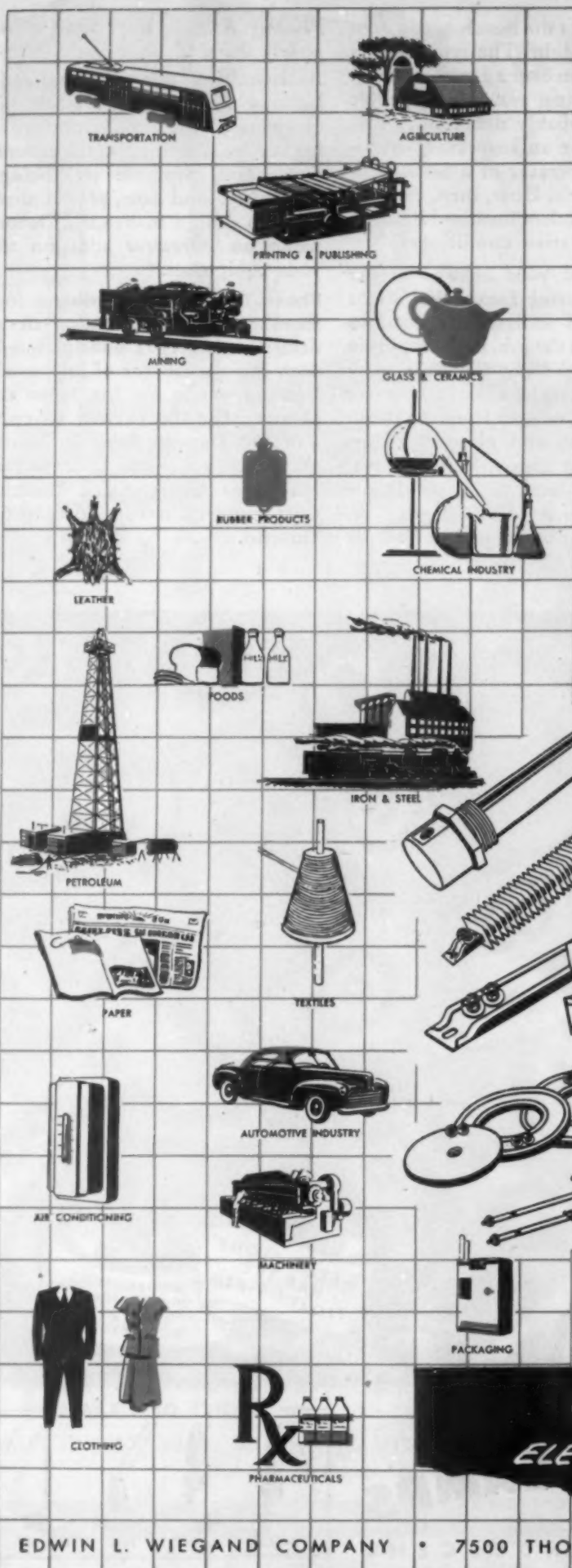
● Prolon Plastics' facilities include a completely equipped laboratory and engineering department, staffed for research and scientific production control. We are prepared to serve you in design and die-making, or to write specifications for your protection. Progressive thinking, backed by more than 100 years' experience, gives you more for your money at Prolon Plastics.

RESEARCH ★ DEVELOPMENT  
DIE-MAKING ★ COMPRESSION  
AND INJECTION MOLDING

FOR BETTER QUALITY, BETTER SERVICE, WRITE TO

**PROLON PLASTICS**

A DIVISION OF  
PRO-PHY-LAC-TIC BRUSH CO., FLORENCE, MASS.



## THESE ADVANTAGES ARE YOURS

1. **EFFICIENT HEAT** when and where you need it to meet your specific requirements.
2. **LOW INITIAL COST**, plus low operating and maintenance cost.
3. **ACCURATE TEMPERATURE CONTROL** for holding the heat within desired limits—regulated automatically or manually.
4. **PROVED PERFORMANCE** in the shops, laboratories and offices of leading industrial plants.
5. **BETTER PROCESS**, production and product—uniformly high in quality, with less rejects.

*with*  
**CHROMALOX**  
*Electric*  
**HEAT**

A NATION-WIDE organization of Application Engineers will gladly give you practical on-the-job assistance at no cost to you.

### WANT MORE "KNOW-HOW?"

Send for your copy of the booklet, "100 Ways to Apply Electric Heat" and Chromalox Catalog 49. Both manuals contain a wealth of application ideas and data on the use of electric heat in industry.



**CHROMALOX**  
ELECTRIC HEATING UNITS

EDWIN L. WIEGAND COMPANY • 7500 THOMAS BOULEVARD • PITTSBURGH 8, PA.

JULY • 1947

55

**CORRECT  
LIGHTING  
is fitted  
TO THE PERSON  
...TO THE JOB**

The man at the bench needs concentrated light. The typist wants illumination over a greater spread. The lighting *you* might prefer would probably differ from that suitable for an inspector, draftsman or operator of a bookkeeping machine. How, then, can you provide efficient localized lighting for such varied conditions?

You'll find your answer in the Dazor Floating Lamp. For Dazor lighting is individually fitted to the user, to the job. Each employee gets *enough* light for clear, easy seeing... light that is *properly placed* to free eyes from the strain of shadows and glare. With no more effort than pointing a flashlight, the hand floats the Dazor reflector to any desired position. Held firmly by the patented Dazor

*Floating Arm*, it stays until purposely shifted.

By installing this personalized lighting for precision work in shop or office you encourage higher production, curb errors and waste, promote well-being and safety. And note, please, that modern design makes the Dazor Lamp an *attractive* addition to your equipment.

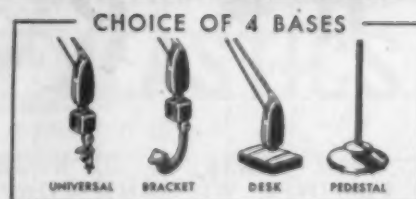
**Phone Your Dazor Distributor** for more detailed information or a demonstration. If unacquainted with this distributor of improved lighting, write for his name to Dazor Manufacturing Corp., 4481-87 Duncan Ave., St. Louis 10, Mo. *In Canada* address inquiries to Amalgamated Electric Corporation Limited, Toronto 6, Ontario.



# DAZOR FLOATING LAMPS

FLUORESCENT and INCANDESCENT

56 MODERN PLASTICS





# For Better Compression Molding

## ELMES

*Since 1851*

### HYDRAULIC EQUIPMENT

## ***This Modern New Press Saves Time, and Cuts Costs***

**Versatile. Flexible. Fast!** The complete new line of Elmes all-purpose compression molding presses sets *new standards* of performance in higher operating speeds—in convenience and accessibility. Designed with an eye on tomorrow, these attractively priced presses are *ready today* to help you cut production costs.

#### **ACCURATE, ECONOMICAL**

Brand new compact arrangement, with integral power and more convenient push-button panel, covers the full range from 75 tons, upward. Extra-large die space permits the use of standard presses on *practically any* job requirements. Molds are protected at closing by an automatic position slow-down which is quickly adjustable for molds of various heights.

#### **NEW FOOT-TREADLE RESET**

New Elmes foot-treadle reset of lower knockout leaves operator's hands free, eliminates reaching, *saves time*.

The adjustable locked-in-type timer is virtually tamper-proof. Presses can be equipped with coordinating control for a high-frequency pre-heating unit.

Other optional equipment includes breathing cycle and selector; bolsters; and steam or electrically heated hot plates. Write today for full information.

#### **ASK FOR THIS FREE NEW BOOK**

12-page Bulletin No. 5200, "Elmes Hydraulic Equipment for the Plastics Industry," gives complete information on these new compression presses—and on transfer presses, Hydrolairs, small-production presses, high-pressure pumps, and Elmes Accumulator Systems. Ask your Elmes Distributor, or write direct for your copy.



ELMES ENGINEERING WORKS of AMERICAN STEEL FOUNDRIES, 225 N. Morgan St., Chicago 7, Ill.  
Distributors in Principal Industrial Centers • Also Manufactured in Canada

METAL-WORKING PRESSES • PLASTIC-MOLDING PRESSES • EXTRUSION PRESSES • PUMPS • ACCUMULATORS • VALVES • ACCESSORIES



# **DURITE**

## **PLASTICS**

### **MOLDING COMPOUNDS**

DURITE meets the rigid requirements of Morse Instrument Company's new picture-developing equipment, providing the sturdy, non-warping, chemical-resistant material demanded by this application. Molded by Vlehek Tool Company. Select DURITE for all-round serviceability.

DURITE PLASTICS INCORPORATED • 5000 Summerdale Ave. • Philadelphia 24, Pa.

## OUR BRAINS APPLIED TO YOUR PROBLEMS

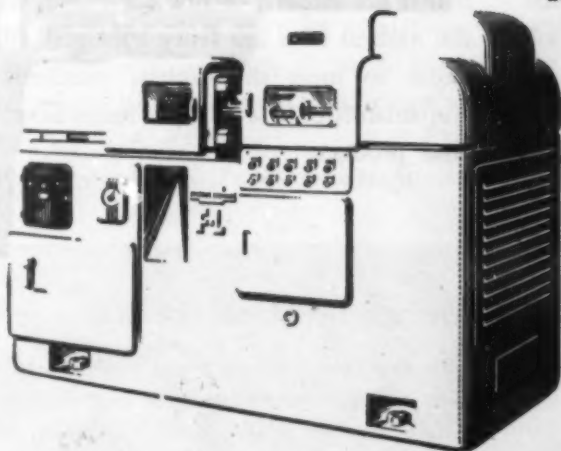
Injection Molding Machines of the Fellows-Leominster line have been greatly refined. The ideas that have been born of users' experience have been worked over by equally experienced engineers. Slide rule calculations, experimental shop work, design and re-design have caused the art of molding machine building to stride ahead. » Fellows-Leominster is, and hopes to be, alert to every practical molding shop need. Some have said, "Variable injection pressures would give us better plasticising control". It is a practical idea, now embodied in our new models. » The re-designed and pace-setting Models (illustrated) exemplify a marked advance toward the type of equipment that will increase molders' profits. For

details on The Fellows-Leominster line, contact The

Fellows Gear Shaper Company, Head Office and Export Dept., Springfield, Vermont. Branch Offices: 616 Fisher Bldg., Detroit 2, or 640 West Town Office Bldg., Chicago 12. New England Distributor: Leominster Tool Company, Leominster, Mass.

MODEL 5C-8

MODEL 1B-2



# Fellows

LEOMINSTER

injection molding equipment

# CLOSE HARMONY IN PLASTICS



It's fun to play, sing with and listen to accordions, but it's no picnic to make them the Wurlitzer way. To design, manufacture and assemble the manifold parts into the finished instrument requires precision engineering and craftsmanship. That is why Wurlitzer assigned Shaw the job of molding the keys. There is no more effective way of working in close harmony where plastics are concerned.

Analysis showed that the job required precision injection molding with close control over color and dimensions. Tough? Sure, but Shaw has the experience and skill to handle such problems with finesse. The sharps are molded of black Plexene, while the natural keys are ivory Plexiglas. Shaw molds to meet the highest standards of craftsmanship. Use Shaw's know-how for your product.



**SHAW INSULATOR COMPANY**

MOLDERS  
160 COIT STREET



SINCE 1892  
IRVINGTON 11, N. J.

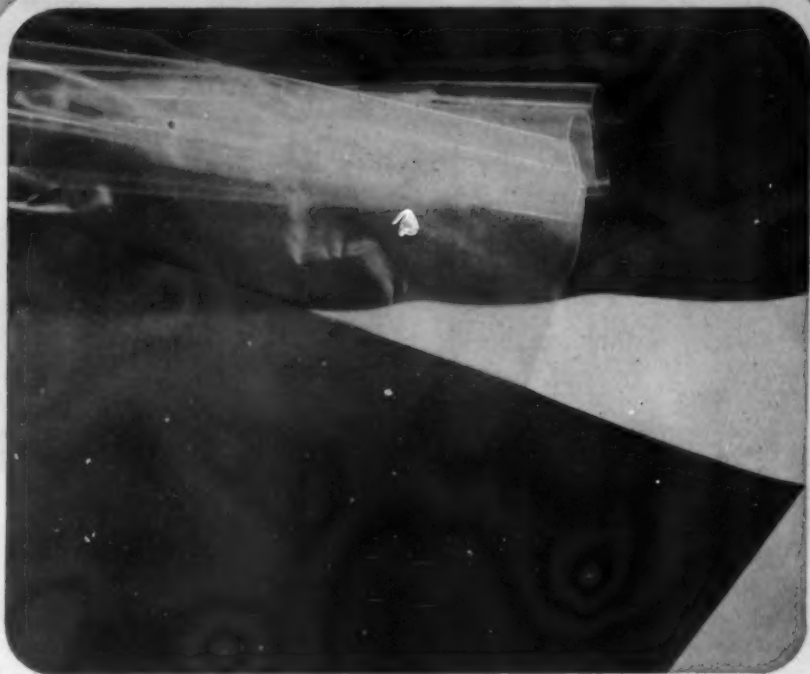
## PLASTICS LITERATURE AVAILABLE

Shaw engineers have prepared a variety of literature, study of which might help you to a decision. Simply write a note about what phases of plastics especially interest you.

Or, you may prefer at once to call in a Shaw engineer, and present your problems for his study. This company's fifty-five years of plastics experience gives him a rich background from which you can draw.

Between the resources of Shaw and the Plax Corporation, Hartford 5, Conn., you can obtain assistance in almost all plastics methods and materials.

# PLAX POLYETHYLENE SHEET AVAILABLE NOW



Give your designers the go-ahead signal. Here is a "natural" that is available now.

Numerous manufacturers are already capitalizing on Plax Polyethylene's versatility and outstanding properties in sheet form, and we know that its availability in quantity will heighten demand. However, we are prepared for it. You can plan for its use with assurance.

Plax Polyethylene, with its exceptional

electrical characteristics, toughness and high resistance to moisture transmission and chemical attack, is supplied in gauges from .001" to .020".

It comes in rolls 500 to 2000 feet long and 36 inches wide. If desired, rolls can be slit according to customer specifications.

For additional information on Polyethylene sheet, rod, and tubing, please write Plax.

## WRITE FOR THIS POLYSTYRENE DATA

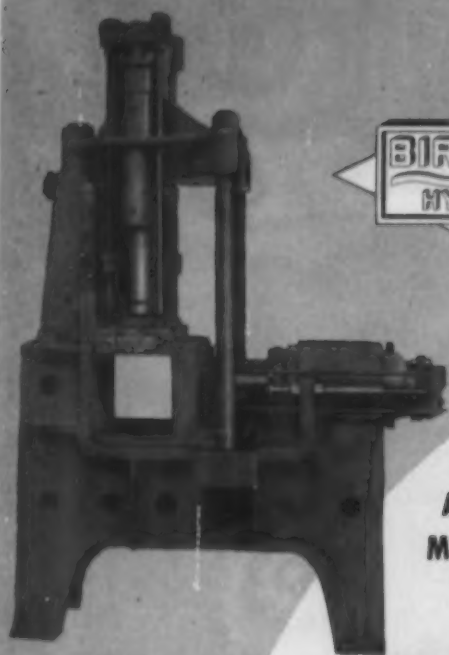
How to Machine Plax Polystyrene Products.  
How to Use Coolants with Plax Polystyrene Products.  
How to Cement Plax Polystyrene Products.  
How to Polish Plax Polystyrene Products.  
Notes on Design and Assembly of Plax Polystyrene Products.  
Die-cut Parts from Plax Polystyrene.  
How to Form Plax Polystyrene Rod.

## AND THIS PRODUCT INFORMATION

Data Sheets on Plax Cellulose Acetate, Cellulose Acetate Butyrate, Methacrylate, Polyethylene, Polystyrene and Ethyl Cellulose Products.  
Article on Plax's Blown Products.  
New special plastic shapes by Plax.



133 WALNUT STREET ★ HARTFORD 5, CONNECTICUT



**Angle  
Molding**



**Laminating**

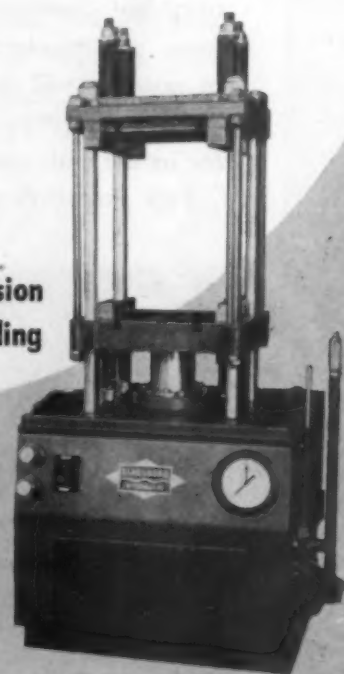
**HYDRAULIC  
PLASTIC  
PRESSES**

## For Fast, Low Cost Production . . .

Presses for molding and laminating . . . Presses that are simple to operate yet unusually flexible and soundly engineered for speedy and economical operation that will give you the edge in the highly competitive days ahead. And their strong, rugged construction insures accurate die and platen alignment to meet rigid specifications for close tolerances. They are made in a wide range of sizes and capacities with manual or automatic controls for self-contained or accumulator operation.



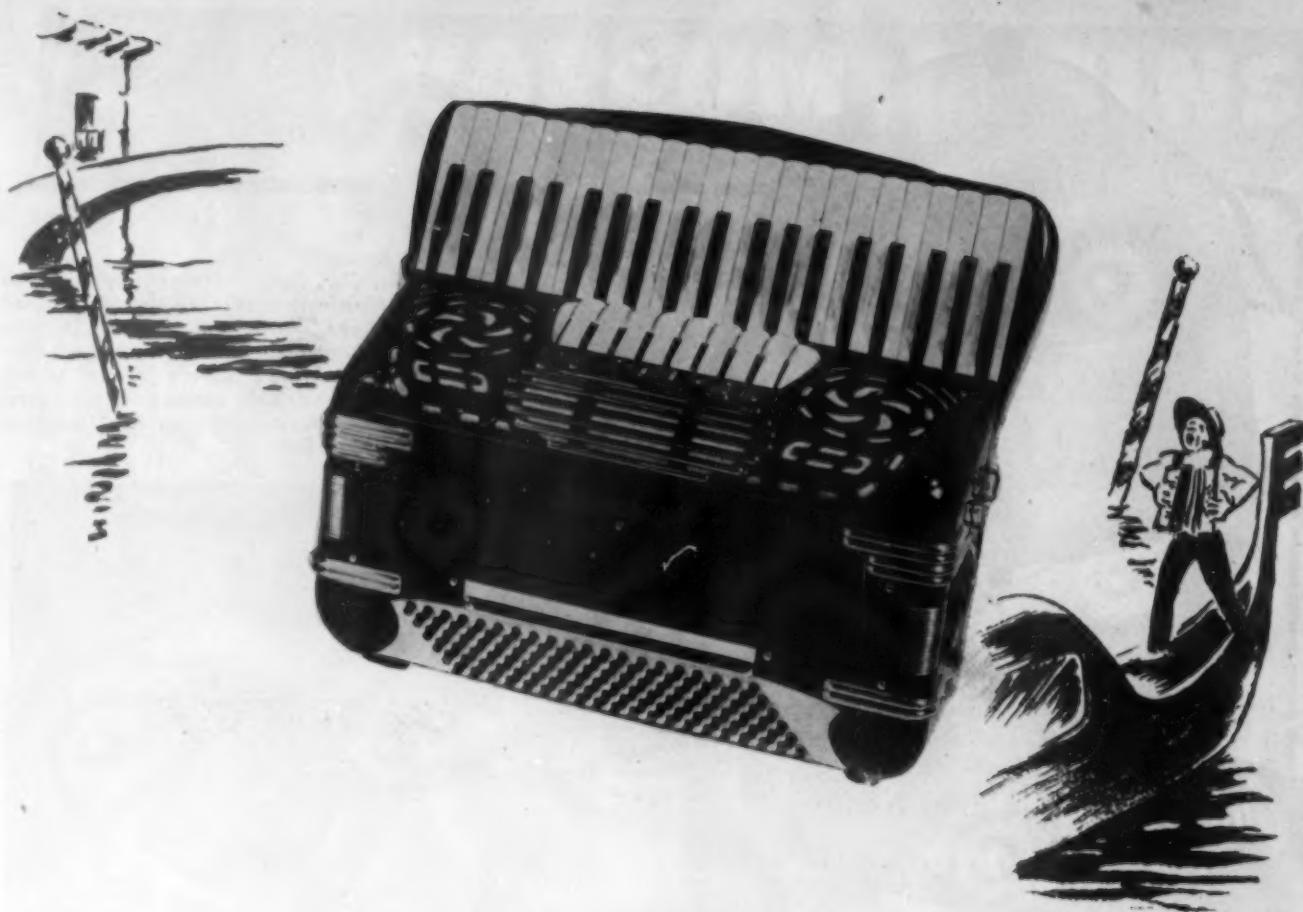
**Large  
Compression Molding**



**Compression  
Job Molding**

BUILDERS OF: Hydraulic Presses - Steel Mill Equipment - Rolls - Special Machinery - Crushing Machinery

**BIRDSBORO**  
**HYDRAULIC PLASTIC PRESSES**



## THE KEYS THEY LOVE TO TOUCH

*Nixon*

**C/N** CELLULOSE  
NITRATE

**C/A** CELLULOSE  
ACETATE

**E/C** ETHYL  
CELLULOSE

*Plastics*

The International Accordion Manufacturing Company of Detroit have been making high-grade accordions for many years. Among professional and amateur accordionists their name stands for beautiful design and tone. We are proud of the fact that Nixon C/N (Cellulose Nitrate) is used in the manufacture of these beautiful instruments. This is another example of the versatility of Nixon C/N, as well as other Nixon Plastics. They lend themselves perfectly to all molding, forming, and fabricating operations. Nixon Plastics are available in sheets, rods, tubes and extruded shapes. Nixon C/A (Cellulose Acetate) and Nixon E/C (Ethyl Cellulose) are also available in molding powders suitable for extrusion and injection molding. Consider where a Nixon Plastic could be used to advantage in your own manufacturing operations.

**NIXON NITRATION WORKS • NIXON • NEW JERSEY**

Representatives: New York, Chicago, Detroit, St. Louis, Leominster Sales Agents: NORTHWEST PLASTICS INDUSTRIES: Portland, Oregon, Seattle, Washington, Canadian Distributors: CRYSTAL GLASS AND PLASTICS, LTD., Toronto, Can. Export Distributors: Omni Products Corporation, 460 Fourth Ave., New York 16, N.Y.



**35%  
SAVED IN  
ASSEMBLY**

● The handles, legs, and hinge cover of this compact, aluminum broiler are securely fastened by 10 P-K Type "Z" Self-tapping Screws. Handles are heat-resistant Bakelite; legs and knob, heat-resisting black plastic. All are fastened to .032 and .040 aluminum body parts. Only one operation per fastening...driving a P-K Self-tapping Screw in a plain hole.

**COMMON SENSE  
ASSEMBLY  
ENGINEERING**



***Beats mounting costs***

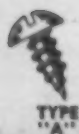
**with "Short-cut" fastening method**

BY REDUCING fastening operations to the fewest possible with the P-K "short-cut" fastening method, the De Lisser Manufacturing Corporation, makers of this "Baby" Flam-e-ingo Table Broiler, side-steps rising assembly costs. Needless operations required for inserts or tapping are avoided...thus assembly is speeded up and costs trimmed 35%. No sacrifice is made of fastening strength or good appearance.

This may be your "out" where higher costs are shading profits. If the P-K "short-cut" fastening

method can be used for your product, why not start making the savings you've been missing? In 7 out of 10 assemblies, P-K Self-tapping Screws will permit assembly work-hour savings—up to 50%—and often simpler, better design with greater strength.

Ask a P-K Assembly Engineer to look over your assembly. Or, mail assembly details to us for recommendations. Either way is a sensible first step towards checking higher assembly costs. Parker-Kalon Corp., 200 Varick St., New York 14.



TYPE  
"A"



TYPE  
"Z"



HEX HEAD  
TYPE "Z"

**P-K**



TYPE  
"P"



TYPE  
"U"



TYPE  
"F-Z"



TYPE "Z"  
PHILLIPS

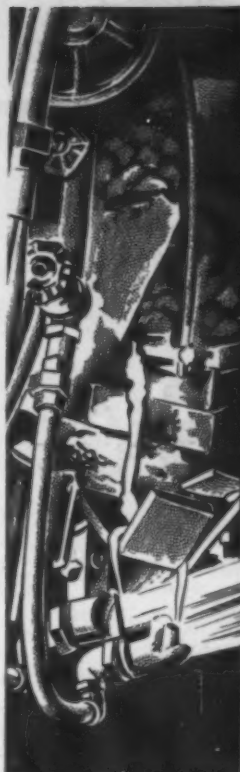
**PARKER-KALON**

**SELF-TAPPING SCREWS**

• A FASTENING FOR EVERY METAL AND PLASTIC ASSEMBLY

# VARCUM RESINS

## *for Insulating Materials*



Top Notch Manufacturers  
Enthusiastically Endorse  
VARCUM RESINS for  
★ ROCKWOOL

HOME AND INDUSTRIAL INSULATING MATERIALS

For low or high temperature, home or industrial insulating material, Varcum phenolic resins are nationally recognized as the ideal bonding agent. Whether you manufacture your products from glass or mineral base, in high or low density, there is a Varcum formula especially designed for your particular use.

**FREE TEST SAMPLE** — If you are a manufacturer of insulating materials, we will gladly supply you with a generous sample of Varcum resin for testing purposes. Just drop us a line on your company letterhead and specify whether you use glass or mineral base in your product.

The illustration above shows how little drops of Varcum resin are mixed with molten slag and compressed air to make one of America's best known insulating materials.

America's best known makers of insulators for homes, electrical appliances, industrial freezer cabinets, drying ovens, boilers, tanks, evaporators, ducts, breechings and heat exchangers enthusiastically endorse these "better than ever" resins, custom made for their industry by Varcum.

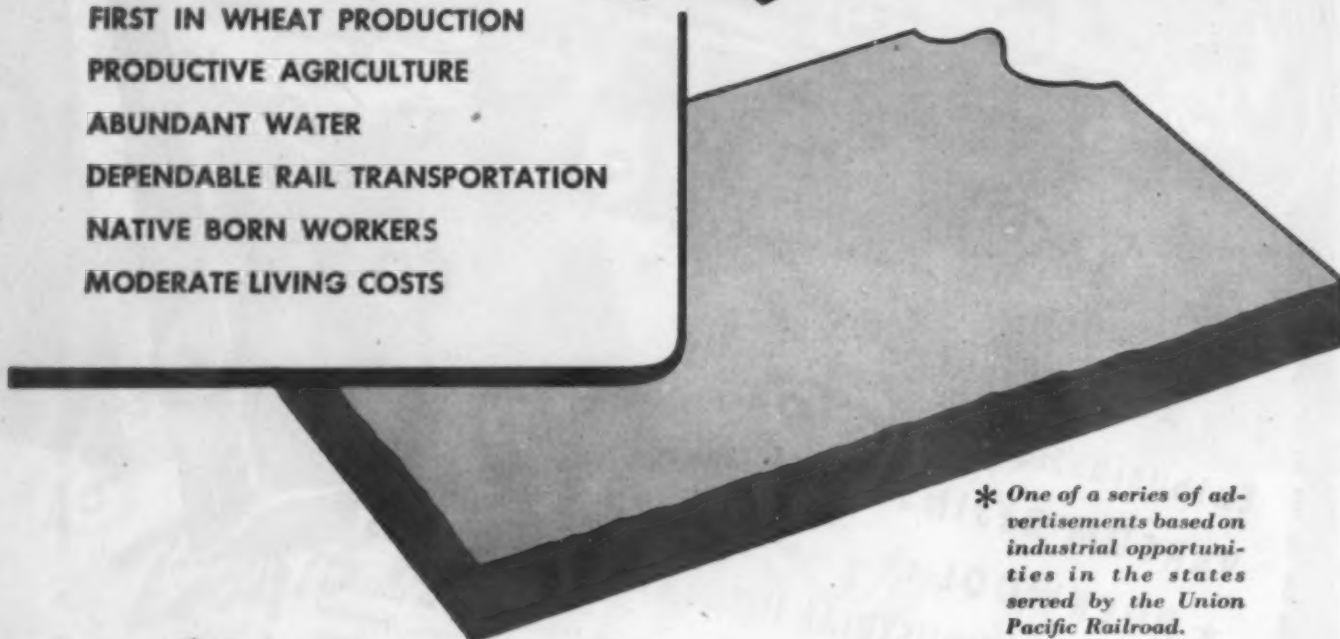
# VARCUM CHEMICAL CORP.

## Niagara Falls, N.Y.



**RICH NATURAL RESOURCES**  
**CENTER OF NATIONWIDE MARKET**  
**PROGRESSIVE INDUSTRY**  
**FIRST IN WHEAT PRODUCTION**  
**PRODUCTIVE AGRICULTURE**  
**ABUNDANT WATER**  
**DEPENDABLE RAIL TRANSPORTATION**  
**NATIVE BORN WORKERS**  
**MODERATE LIVING COSTS**

# Kansas \*



*\* One of a series of advertisements based on industrial opportunities in the states served by the Union Pacific Railroad.*

**K**ANSAS—almost in the exact geographical center of the United States; an important factor to industries serving nationwide markets.

Agriculture is king. Kansas normally ranks first in wheat production. In addition to grains, vegetables and fruits, a large part of farm income is derived from livestock and poultry.

Kansas industry keeps step with agriculture. There are approximately 2,500 manufacturing and processing establishments. Over four million

tons of coal are mined annually. Here is the largest natural gas field in the world. Eighteen principal rivers with two great watersheds provide an abundance of water. The population is 97 per cent native born.

\* \* \*

Kansas . . . the hub of a rich market; a treasure chest of natural resources with dependable labor; outstanding public health record; moderate living costs; and excellent transportation over Union Pacific rails.



**be Specific - say**

**"Union Pacific"**

*\* Address Industrial Department, Union Pacific Railroad, Omaha 2, Nebraska, for information regarding industrial sites.*

## UNION PACIFIC RAILROAD

THE STRATEGIC MIDDLE ROUTE

 **VAN DORN** *Leads Again!*



*with its* **NEW 3\* 02.** \*PLUS

## **PLASTICS INJECTION PRESS**

**EFFICIENT • VERSATILE • ECONOMICAL**

**THE VAN DORN IRON WORKS CO.**

2687 EAST 79TH STREET

CLEVELAND 4, OHIO



*Get a unit that'll "take it"*

WHEN YOU INVEST IN HIGH FREQUENCY HEAT

*Get a Thermex*

WHEN you invest in high frequency heat; make sure of full benefits from this electronic technique of heating plastics material for molding. Get a dependable high frequency heating unit. Get a Thermex Red Head.

Thermex ability to "take it" has been a matter of record for years. Thermex was the first practicable industrial high frequency dielectric heating equipment put on the market. The first Thermex units installed are still going strong. Built by the organization that has been specializing in dielectric heating equipment since the beginning, the Thermex Red Heads of today are bound to be more efficient and dependable than ever.

If you are converting or expanding your molding facilities, if you are building a new plant, find out about Thermex Red Heads. They constitute the most complete line of high frequency heating units for the plastics industry. Mail the coupon or contact Girdler branch offices at 150 Broadway, New York 7; 228 N. LaSalle Street, Chicago 1.



THE FIRST INDUSTRIAL  
HIGH FREQUENCY DIELECTRIC  
HEATING EQUIPMENT

The Girdler Corporation, Thermex Division,  
Louisville 1, Ky.

Please send complete information about Thermex.

Name..... Title.....

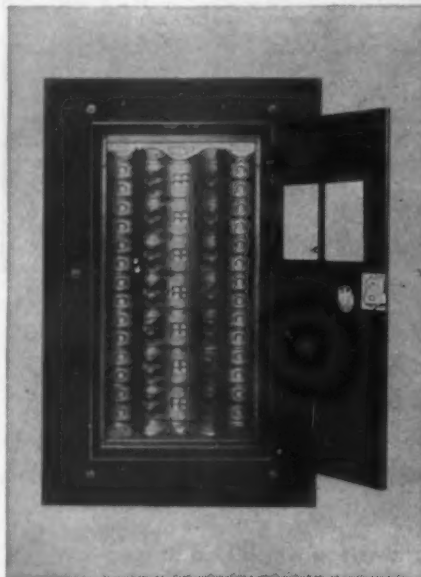
Firm Name.....

Address.....

THERMEX and RED HEAD—Trade Marks Reg. U. S. Pat. Off.

**CASTING PROBLEM  
SOLVED 17 YEARS AGO**

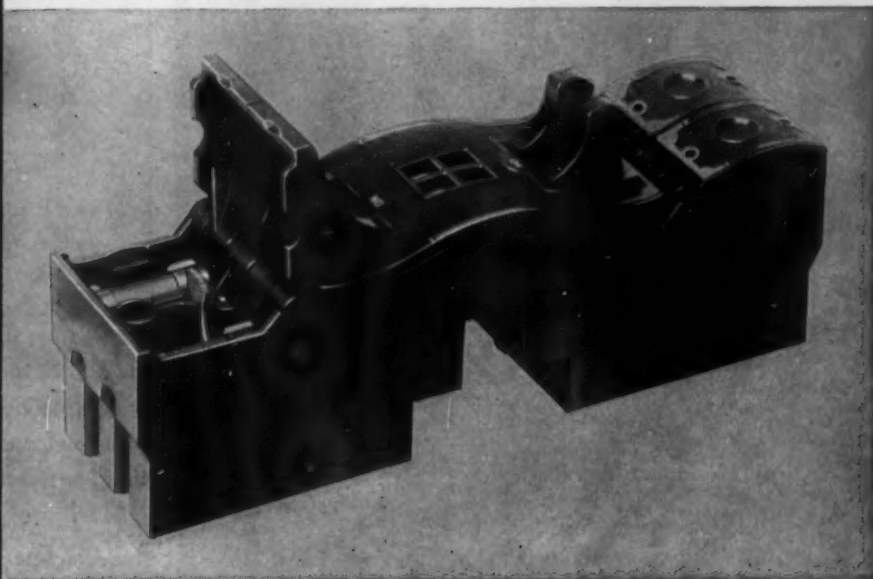
When the Bulldog Electric Products Co. re-designed their famed Superba lighting panelboards back in 1930, their engineers sat down with ours to explore plastics. The result was this phenolic housing offering high dielectric strength, great durability, attractive appearance and production economy for complicated shapes. Today, the Bulldog Superba unit is a leader in the field. *The original mould, with modifications for design refinements, is still in use after paying for itself many times over.*



# What's newfangled about plastics?

**Let's admit it**—Sunday supplements to the contrary, moulded plastics have limitations as definite as their advantages. Blame it on war-time shortages or blame it on over-enthusiasm, these limitations have sometimes been ignored with unhappy results.

Nevertheless, the phenomenal growth of the plastics industry proves that sound applications engineered by careful custom moulders have far outnumbered the unwise uses. We have made a practice of rejecting *misapplications* at Kurz-Kasch—turning down many jobs offering immediate profits but long term grief. If we work with you on plastics, rest assured of this—plastics will be to your advantage in physical characteristics and costs—your design will assure you of simplified production and protracted use—your moulds will be engineered for many, many years of increasingly profitable life.



## Kurz-Kasch

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MACHINED	37.8%	CAST.....	22.4%

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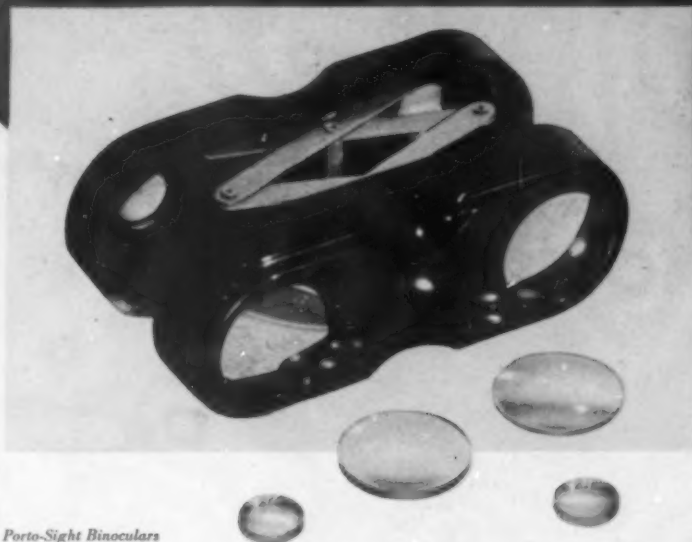
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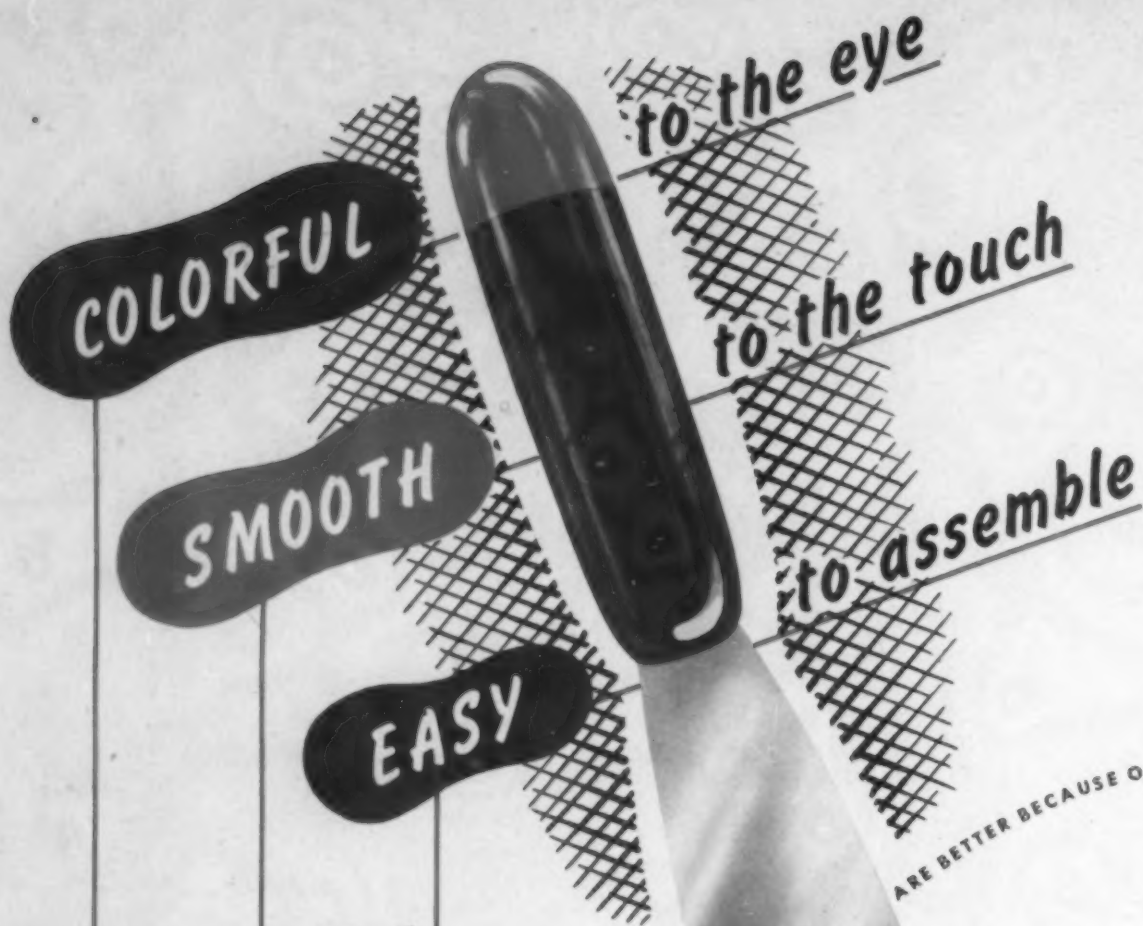
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## Plastics improve textile machinery

*Higher speeds, lower costs, even some new textile processes come from increased use of plastic parts*

**I**N EVERY century a revolution in textile manufacture has taken place. One, which started in the early thirties, and which is largely dependent on applications of plastics to textile machinery, is going on right now. It involves the development of larger and faster units and, since V-J day, its pace has been terrific because of three factors: the general use of higher-cost labor in textile plants, the emphasis on greater speed and accuracy of production and the increased versatility of the textile manufacturers.

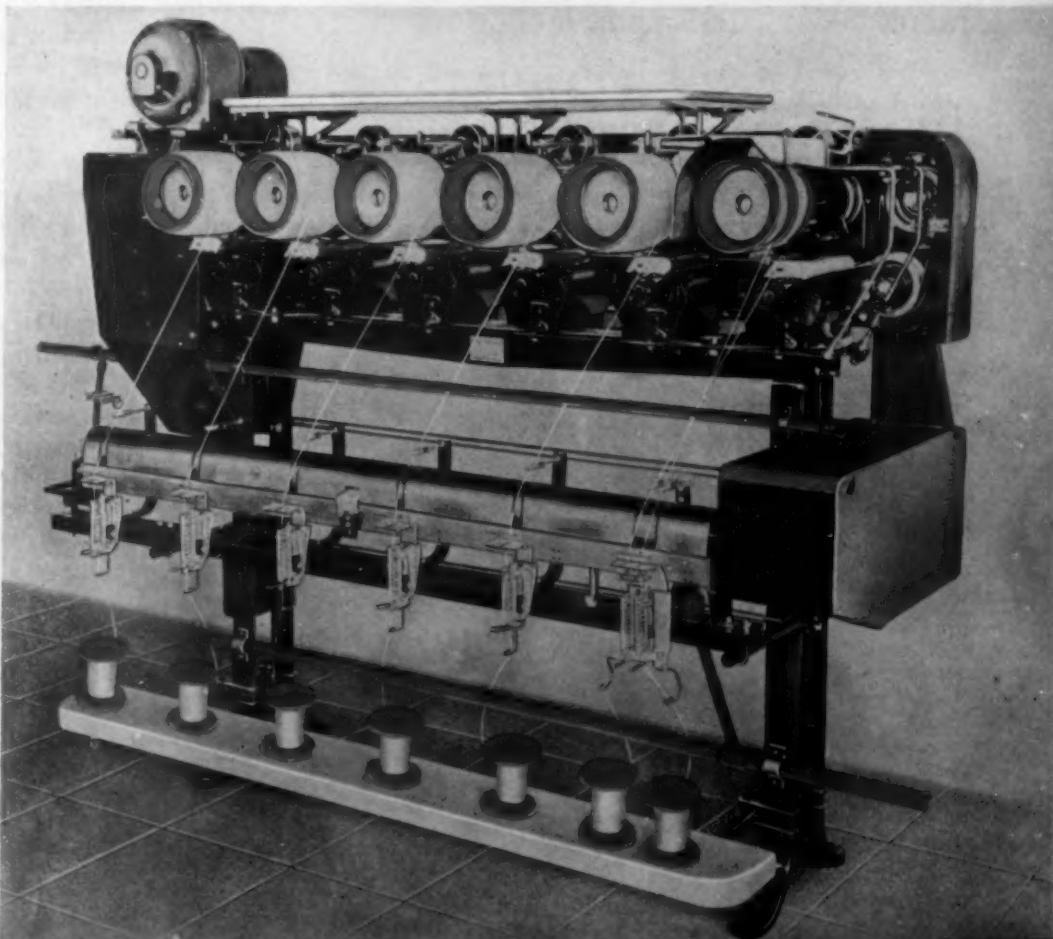
The prewar peak of this revolution came in 1939 when the Industrial Rayon Corp. installed in a \$12,000,000 plant at Painsville, Ohio, a new process for continuously spinning viscose rayon. The process was developed by Rayon Machinery Corp., a subsidiary of Industrial, and depended on many components made of

molded and laminated plastics. These applications were rated by the judges of the Fourth Annual MODERN PLASTICS Competition as the number one job of the year 1939.

Key item in the machinery (see Fig. 3) which permitted doing in five minutes to a single thread on a continuous basis things that formerly took 80 hr. on a batch basis, was a "thread-advancing reel" molded of Durez by The Richardson Co., Melrose Park, Ill.; General Industries Co., Elyria, Ohio, and Northern Industrial Chemical Co., 7-11 Elkins St. S., Boston, Mass. More than 86,400 complete reels were ordered for the 96 spinning machines, making this the largest order for molded parts placed up to that time.

The process was described in March 1939, issue of this magazine. More recent developments in it will

PHOTO, COURTESY SYNTHANE CORP.



1—Textile machinery used in the sizing of nylon has bobbins, caps and piping made of laminated plastic materials

be discussed later in this article. It marked the pre-war peak of a revolution in textile machinery through the increased use of plastics, a revolution whose previous high spots were: the Roto-Coner, first made by Westinghouse Electric Corp., Trafford, Pa., for Universal Winding Co., Providence, R. I. (see Figs. 4 and 5) in 1936; the molded-laminate spinning bucket, first made in the United States in 1922 by Westinghouse Electric Corp., a modern version of which is shown in Fig. 6; laminated tenter rails made by National Vulcanized Fibre Co., Wilmington, Del., in 1934; picker sticks made by E. E. Jacobs Mfg. Co., Inc., Danielson, Conn.; and laminated bobbins, thread guides, gears and bearings by several makers early in the last decade.

### Reasons for plastics

The part that plastics textile machinery parts play in the huge and complicated collection of processes for making textiles is based on (a) their ability to be given perfect dynamic balance through their dimensional stability, (b) their resistance to chemical attack,

(c) their durable smooth finish, (d) their light weight in large sized pieces and (e) their ability to combine in fabrication with metal, taking advantage of the better properties of both materials.

### How textiles are made

To understand this, a short and frankly over-simplified description of the field will be helpful.

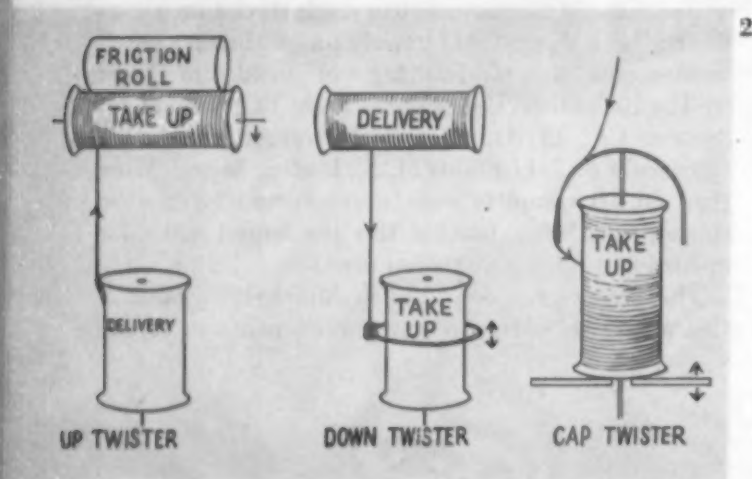
First, there is King Cotton. The textile industry in the United States consumed an average of 5 billion lb. of cotton per year over the past six years. Cotton is ginned to remove seeds and dirt, then baled and sent to the spinning mill. Here the bales are opened and the cotton picked to clean and blend it. Then it is "carded," to orient the fibers in one direction. Long fibers are further combed and straightened; short fibers are not. Then comes the drawing out, "roving" and twisting of fibers, and the final spinning on "packages" which are usually in the form of cones of fiber or wood, or bobbins.

Next in importance is rayon. Production in 1946 was almost 900 million pounds. There are three basic rayon types made in this country, all involving use of cotton or wood to provide cellulose as a raw material. In the viscose process, which is responsible for 88 percent of the world's production of rayon, cellulose is treated with carbon disulfide in the presence of caustic soda to form a liquid which is squirted through a spinneret into an acid bath where it immediately hardens to form as many filaments as there are holes in the spinneret. A number of filaments, gathered together coming out of the acid bath, form a multifilament viscose rayon yarn which is collected in one of three ways: (a) wound parallel and untwisted on perforated (usually aluminum coated with Heresite phenolic) bobbins; (b) spun over a couple of wheels and dropped into a centrifugal spinning pot or spinning bucket which rotates at from 3000 to 10,000 r.p.m., forming a winding of yarn from the wall of the pot into the center, the result being called a cake; (c) passed out of the bath downward over a series of revolving spools or reels in the continuous process, receiving at each spool a bath of finishing chemical through a *piddle pipe*, and ending up wound and twisted on a bobbin, ready for fabric making.

In the cuprammonium rayon process, the cellulose is treated with copper sulfate and ammonium hydroxide by American Bemberg Corp., the only important user of this method. It is spun into a funnel through which flows soft deaerated water, stretched slightly in the funnel, then given a bath of sulfuric acid, stretched again in passing out of the bath over a roller and reeled in skeins.

The third process, for acetate rayon, is exactly the same processes as that used for making cellulose acetate flake. Once the flake is made, it is changed into a liquid by adding water and acetone and is spun through a spinneret down into warm air inside a cylinder. Here it hardens by evaporation of the acetone, and is wound on a bobbin, a *take-up sleeve*, a cone or other package.

Fiber number three is wool, of which about 750 mill-

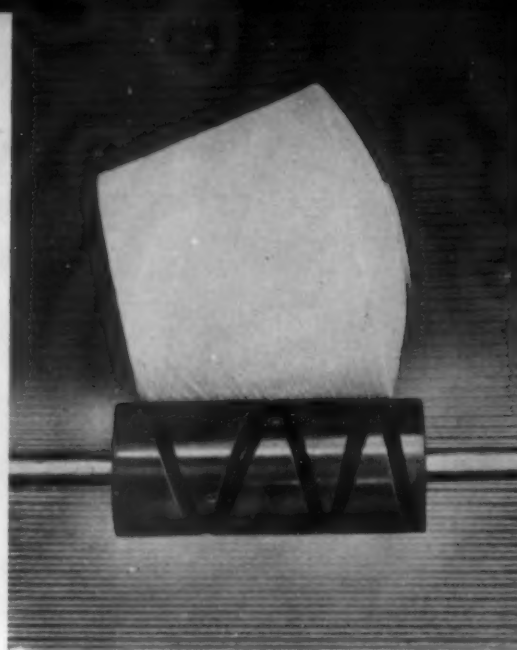


2 (Above)—Three types of twisters, all utilizing plastics.  
3 (Below)—Many parts of the thread advancing reels on continuous viscose rayon machine are molded of phenolic. In some cases, the special qualities of these reels have increased production rates as much as one thousand times

PHOTO. COURTESY DUREX PLASTICS & CHEMICALS, INC.

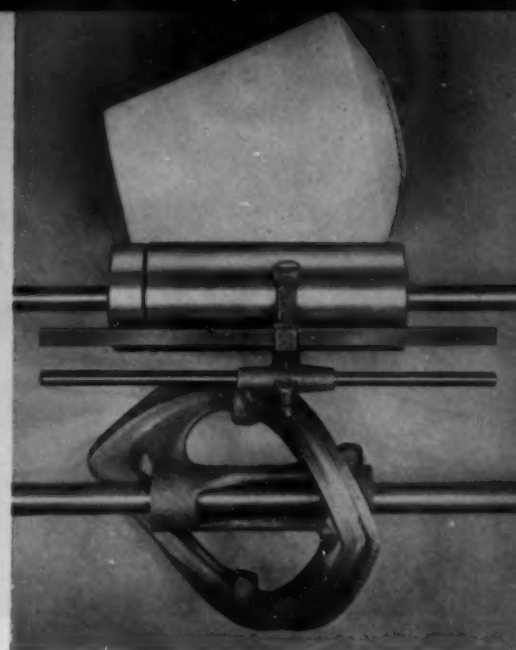


4—Now standard in the textile industry is a phenolic roto-coner which takes the place of one made of metal. 5 (Extreme right)—As can be seen, metal roto-coner was complicated as well as heavy



4

PHOTOS, COURTESY UNIVERSAL WINDING CO.



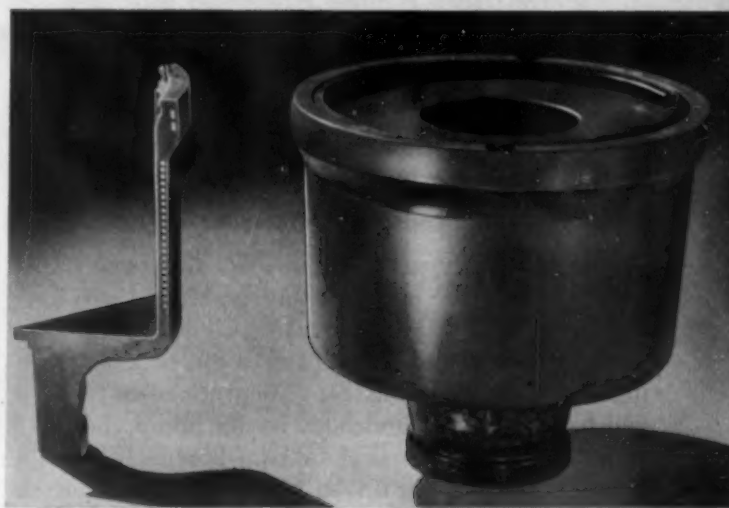
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ion lb. was processed last year. Wool is cleaned and de-greased by washing with soap, by solvent process or by freezing and dusting out. Then it undergoes burr picking, burning or carbonizing to remove vegetable matter, is scoured, carded to orient the fibers, combed or gilled, drawn out and doubled or *roved*, and finally, spun onto a cone, bobbin or other package.

Silk consumption in the United States has fallen from 80 million lb. in 1929 to about 4 million in 1946. In this case the spinning is done by a worm, and the first problem is to get the filament off the cocoon on to a reel or skeiner. This used to be a hand operation in which Japan could beat the world on labor costs, but a new machine for semi-automatic reeling has now been invented. Following reeling, the silk in skeins is *thrown* or twisted into ply yarns and wound on bobbins.

Nylon in flaked polymerized form is melted and pumped through several holes in a spinneret into warm air, then into a conditioner, where the monofilaments are lubricated so they will stick together. Then it is wound on a cone. From a cone, the nylon threads are drawn over rolls revolving at different speeds, stretching the yarn, lining up the molecules of plastic to give it the great strength recognized in this fiber. The nylon thread is then sized with a water-soluble material, such as polyvinyl alcohol, to protect it in further handling. It may be twisted, and is *set* under tension or pressure in either yarn or fabric form by means of steam or by use of hot water.

These are the main fibers processed by the textile industry. For the processing information we are indebted to "America's Fabrics," by Zelma Bendure and Gladys Pfeiffer published by The Macmillan Co., New York City, and to R. L. Foote, Synthane Corp., Oaks, Pa. There are also the natural fibers such as flax (linen), jute, hemp, ramie, sisal and several kinds of furs, the other synthetics, made from vinyl copolymers, Aralac made from casein and glass fiber. Even asbestos fiber and metallic threads go through textile processing of some sort. In addition to all these, there are today innumerable combinations of them—aluminum thread



PHOTO, COURTESY OSCAR KOHORN & CO. LTD.

6—A molded-laminate spinning bucket. The cut-off section at the left shows inner construction of the bucket

coated with vinyl, wool-rayon combinations, fur-cotton—to name a few.

#### From fiber to fabric

So far we are only at the yarn stage. There remains more spinning, then weaving, knitting, lacemaking, dyeing (which may take place at any of several stages in the case of any fiber), treating, finishing and frequently printing. Usually in each stage of each fiber's fabric-making system a special type of machine is required, but nylon and rayon can be run over silk manufacturing system and heavier fibers have been run over wool systems. Seldom do two fibers react alike to the same handling methods. In all cases the demand is for equipment that will be faster, more accurate and saving in labor costs. The fiber individualities and the fact that synthetics are produced from and by the use of corrosive chemicals and acids necessitated the use of materials which could take the punishment.

Below are discussed, against the background of proc-



PHOTO, COURTESY CLARK THREAD CO.

7



PHOTO, COURTESY SYNTHANE CORP.

8

7—Ring travelers for down-twisters are molded of nylon, outlast those of bronze. 8—Examples of pirns show (left to right): a maple pirn wound with nylon; the latest laminated plastic pirn; a maple pirn, warped by pressure; a laminated phenolic pirn with bronze bushing. Head of latter popped off due to great pressure

ess methods given above, several important and recent applications of plastics in textile machinery. Some are illustrated.

#### Twisters of various kinds

Starting with great grandma's spinning wheel, and not forgetting the ancient spinning Mule, there have been built several kinds of twisters, all designed to take thread off bobbins and add thread to other bobbins, twisting it in the process (Fig. 2). There are down-twisters, which deliver from a horizontal bobbin above, through a *ring traveler* to a vertical take-up bobbin below, the take-up bobbin being driven by a spindle, the threads passing through travelers which float around a steel ring, the ring moving up and down the take-up bobbin, laying the thread on at an even rate, twisting it at the same time. Until a few months ago these travelers were made of steel or bronze, but a nylon traveler, covered by patents issued to W. M. Camp and assigned to the Clark Thread Co., Newark, N. J., is proving of interest to both textile machine makers and the textile mills. The plastic traveler is expected to permit increased spindle speeds, reduce or eliminate greasing and oiling, make rounder and fuller yarn and thread, reduce end breakage and give longer life to both rings and travelers (see Fig. 7).

In an up-twister, yarn is delivered from a vertical bobbin to a horizontal bobbin above it. The take-up bobbin is driven by a friction roll operating against it, the driving roll being in a fixed position and the take-up bobbin moving on its axle out from its starting position to allow more thread to be added. Thus, the surface of the take-up package moves at a constant rate of speed. A typical up-twister, although larger than any previously made, is that developed for rayon tire cord twisting by the Whitin Machine Works, Whitinsville, Mass. This machine takes two twisted packages weighing  $4\frac{1}{2}$  lb. each, both twisted in the same direction, and deliv-

ers them to a single 9-lb. package cabled in the opposite direction. These packages are far larger than prewar sizes. They necessitate the use of stronger, better balanced bobbins. Even though the axle speed may be slower (5500 r.p.m.) as compared with small-package twisting (9000 r.p.m.) the outside of the bigger package moves much faster, so precision-balanced laminated plastic bobbins are used.

Industrial Rayon Corp. at Painesville, Ohio, using its continuous method of making viscose rayon, employs the *cap-twister*, placed below each row of thread-advancing reels (mentioned at the beginning of this article) which accepts the finished yarn. Cap is smooth hollow hemisphere and sleeve of plastic and metal over which yarn travels at constant rate of speed. It is still on its quill support while the twisting bobbin moves up and down inside it, turning constantly. The yarn goes round and round the cap, twisting the many monofilaments as it is delivered. The new bobbins used in this process for making tire cord of great thickness, are easily twice the size of the ones originally used on the machine. So they are laminated plastic, balanced to within 0.01 oz.-in. (weight accuracy at 1 in. from core), saving bearings from shock and vibration and producing a perfect package.

#### New design in bobbins

Aside from balance in plastic bobbins mentioned above, there is the important matter of strength. Figure 8 shows the steps in the development of a better bobbin, in this case a shipping *pirn*. Second from right is maple, warped from the more than 5000 p.s.i. pressure exerted by the nylon yarn wound on it (as in the left picture). The one at right is all-plastic except for bronze bushings; the head has popped off due to pressure. The second from left is laminated plastic over a flanged steel core. It is an inch longer, lighter in weight than the all-plastic pirn and far stronger.

Late last year E. I. du Pont de Nemours & Co., Inc. brought out the first 15-denier nylon monofilament, so fine that it runs 300,000 yards to the pound. With stuff that fine there can be no chances taken with the sticking and pulling which is so likely to happen when it is drawn from a wooden pirn. The fiber is expensive and waste of both material and time cannot be tolerated. The Liberty Throwing Co., 1450 Broadway, New York City, overcame the problem by using a plain Bakelite laminated tubing on a coning machine, with an adapter made by Universal Winding Co. Used with the simple new package, shown in Fig. 9, was Liberty's new lubrication sizing and a chemical static eliminator. Static on such a fine yarn is serious because it takes 8 hr. to fill a tube. The new package accepts from 8 to 10 oz. of the fine nylon as compared with the 5 to 6 oz. capacity of the former paper cone, and proved so satisfactory that for a period of some months, Liberty contracted for the entire output in that size of tube of the National Vulcanized Fibre Co., Wilmington, Del.; Synthane Corp., Oaks, Pa., and Spaulding Fibre Co., Inc., Tonawanda, N. Y. Production on the package still lags way behind the market. Assuming that Du Pont will make up to 20 million lb. of this fine denier nylon monofilament a year, there will be a market for several hundred thousand such tubes. Paper tubes were tried but failed because the nylon thread, shrinking around the tubes crushed them. The plastic stood up perfectly.

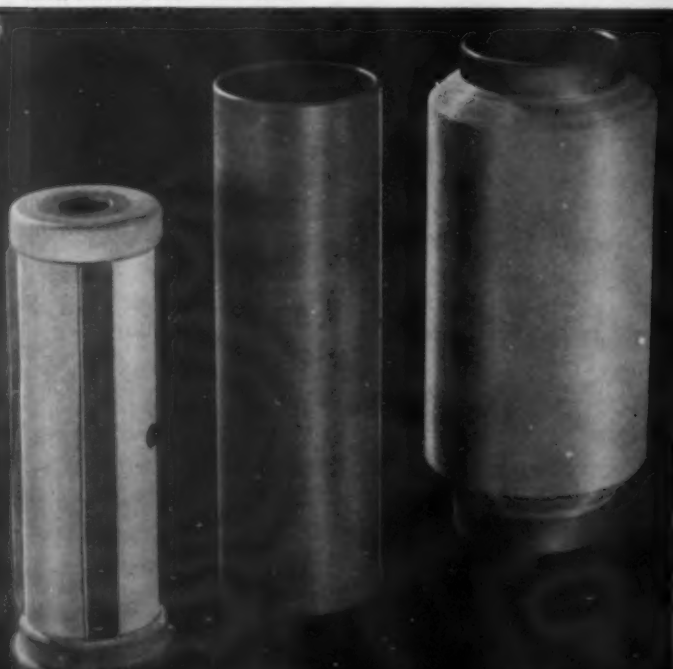
Synthane Corp. has developed a special adapter for this type of tube pirn, made entirely of plastic except for two coil springs and a setscrew. It is illustrated at left in Fig. 9. This method and use of adapter allowed the tube pirn to become a returnable shipping package.

#### Where wood wouldn't work

In setting up the warp or lengthwise threads in weaving cloth—the shuttled sidewise threads are called

9—An adapter (left) is put inside laminated tube (center) replacing a paper cone to facilitate yarn winding

PHOTO, COURTESY LIBERTY THROWING CO.



“fill”—it has been customary to wind pancake windings of thread onto a “warp beam,” or long spool, the threads coming from thousands of delivery cones or pirns racked on a creel. Using the former pirns, the whole process had to stop while the operator tied the end of thread on one cone to the start of the next which replaced it on its peg in the creel. With the bobbin shown in Fig. 10 replacing the cone, and with two such bobbins mounted on a revolving base on the creel, the process is now continuous, because the operator ties the end of thread left over at the bottom to the start of the new bobbin when winding starts from bobbin number one. This bobbin is a receiving bobbin on a down- or ring-twister for acetate rayon, with a transfer tail. On a wooden bobbin this availability of the starting end of thread would not be possible because the sensitive yarn would break while the last layer was being taken off the barrel. The plastic unit has a molded head and base with a laminated paper base barrel, finished with baked lacquer in buffed finish. A possible further development of this principle would mean rayon manufacturers could ship single 1000-lb. packages as complete work beams instead of one thousand 1-lb. packages.

#### Solving dye problems

One advantage to the cake or bucket spinning (see page 74 on rayon spinning) of the rayon is that the fiber in cake form may be processed in relaxed condition. If wound on a rigid core, a pressure gradient is created from zero on the outside of the winding to high pressure in the center. This can result in faults, including a variation in the color a given dye will impart to the rayon. So it is sometimes advisable to dye in cake or skein form. A development by Synthane permits spool-spun rayon to be delivered through an up-twister to a tapered take-up bobbin which has first been covered with a knitted sock. After the package of yarn has been built up on the tapered bobbin over the

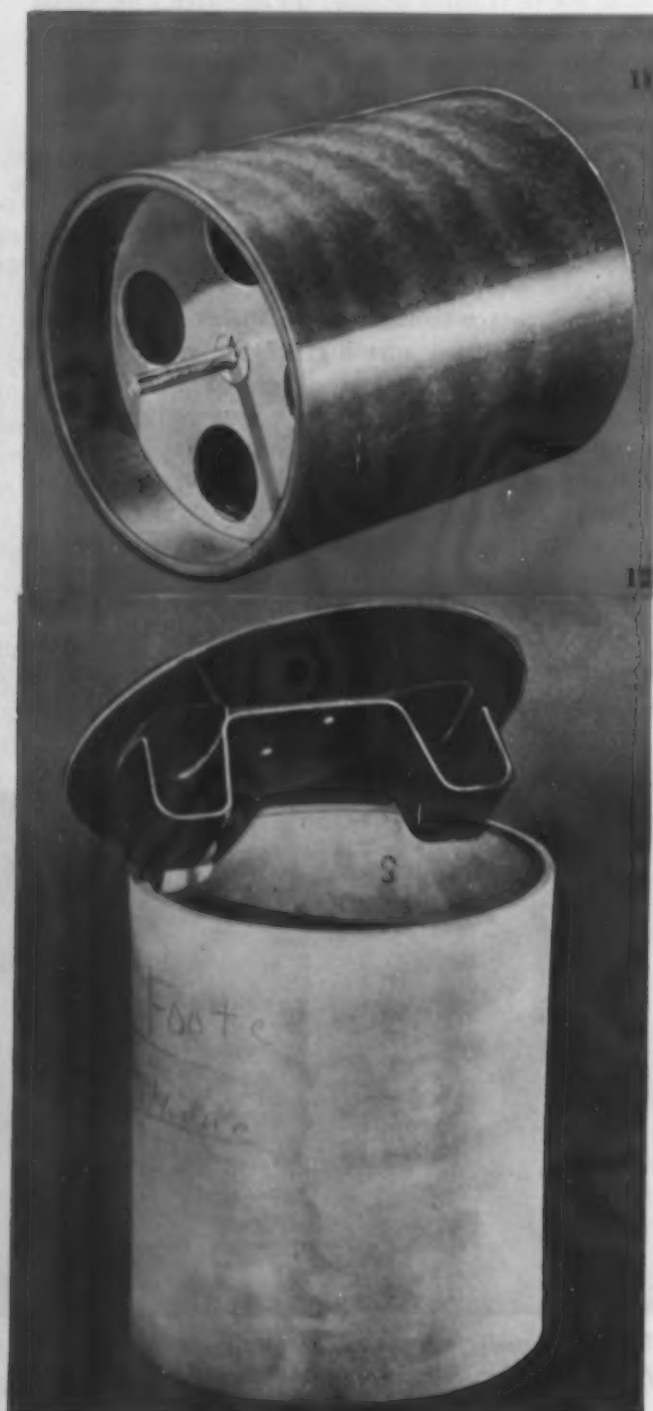
PHOTO, COURTESY SYNTHANE CORP.



10—Laminated receiving bobbin for rayon, made with transfer tail to accomplish continuous winding to a warp beam

sock, the bobbin is slipped out of the sock leaving a rayon cake for relaxed processing. The take-up bobbin, weighing 11 oz., has great impact resistance, as it is a combination of laminated phenolic and stainless steel. It is designed with a black head on top and a red head on the bottom, inside the ends, the bottom head having four holes for machine removal of bobbin from cake. Like all up-twister take-up bobbins, this one is driven

11 (Top)—A take-up bobbin, covered with a knitted sock, is used to form a cake for dyeing rayon yarn. 12 (Bottom)—Cap of the bobbin, which permits smooth flow of thread on the bobbin, has leaf-spring made of postformed laminate



by a friction cylinder (see Fig. 11 in opposite column).

In silk skeining of reeling (see paragraph on silk processing above) it is a standard practice to use a skein reel or *swift*, which is essentially two spiders on a central axle joined by four wooden bars about 4 ft. long on outside circumference. The silk is reeled onto these bars, and to remove the skeins, a collapsing device permits one bar to fold inward toward the axle. The hardest wood failed generally in the application, since it splintered and wore and became stained. Now some silk skeiners are using either of two kinds of laminated phenolic surface on the outside of these devices. In one case a tube of plastic replaces the wooden bar; in the other case a three-quarter cylindrical skein of laminate is snapped over the wooden bar. Further development of this principle is being applied to wool skein reels up to 14 ft. long. The plastic costs ten times as much as the wood, and is cheaper in the end.

#### Postformed spring application

Redraw caps are numbered in the hundreds of types. They are used for a smooth flow of fiber off delivery bobbin—a portable smooth edge. Sample in Fig. 12 features one of the few leaf-spring applications of laminate in the world. It is a postformed job to cap a sizing bobbin from which nylon is being removed. The use of a 3 percent solution of polyvinyl alcohol (see page 75 on nylon processing) means that a non-corrosive substance must be used in all nylon processing machinery.

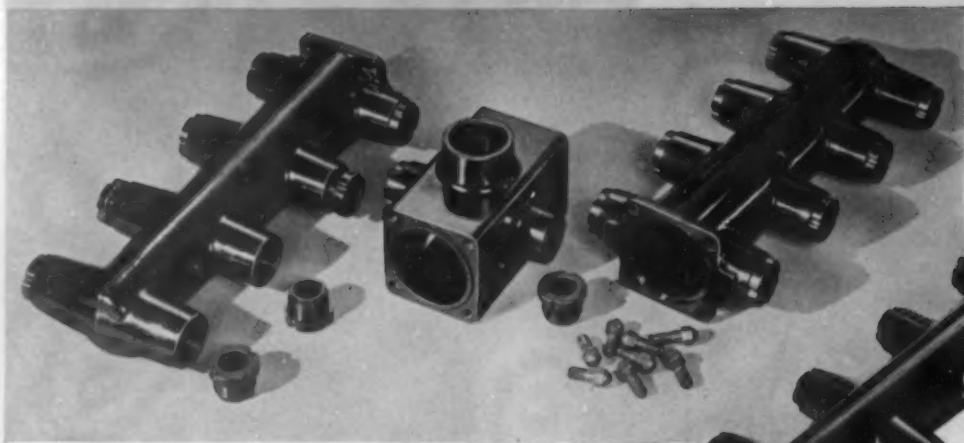
Stainless steel is laminate's only competitor in field. But stainless steel costs five times as much. A tremendous new development in nylon processing is shortly to be announced, involving the use of one of the largest molded-laminated and laminate tube bobbins produced to date.

United Knitting Machining Co. makes *verge plates* for full fashioned hosiery knitting machines, using  $\frac{3}{16}$ -in. laminate plate on top of a  $\frac{1}{8}$ -in. strip of rolled brass, having formerly put two materials together with rivets and screws. Impact and vibration in use shortened the service life of the verge plates until the company decided to bond the plastic to the base with the use of Pliabond adhesive.

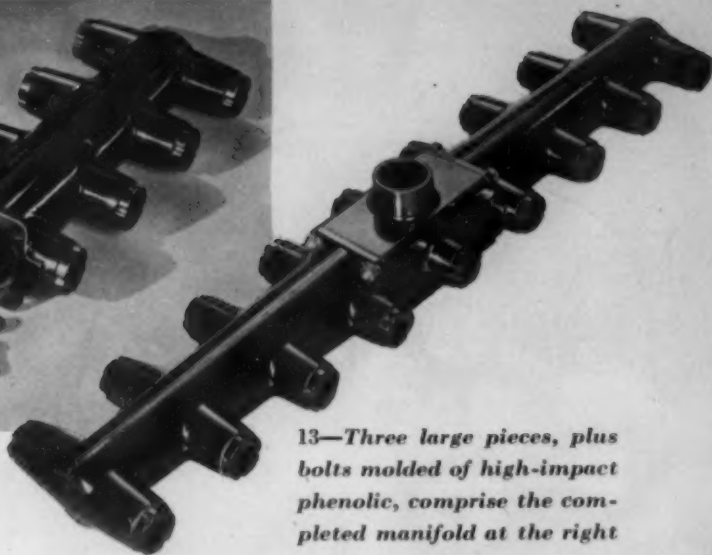
Standard Hosiery Mills, Alamance, N. C., in collaboration with Formica Insulation Co., 4614 Spring Grove Ave., Cincinnati, Ohio, developed the item shown in Fig. 14, in order to reduce rejects caused in handling the hosiery during operations in which hose pass from one machine to another. The tray and the "U"-shaped stocking carrier are both postformed from flat laminated sheet stock. They are light in weight, non-corrosive and non-denting, as well as being extremely smooth. The use of these items is estimated to have reduced "picks" and "snags" by 10-20 percent.

#### New rayon project

Figure 13 shows a portion of a huge new project, information on which is expected to be released shortly. It is a rayon manifold molded for American Viscose Co., Marcus Hook, Pa., by American Insulator Corp.,



PHOTOS, COURTESY DUREZ PLASTICS & CHEMICALS CORP.



13—Three large pieces, plus bolts molded of high-impact phenolic, comprise the completed manifold at the right

New Freedom, Pa., from Durez material. These are big moldings, each end piece being about 2 ft. long and the center section being around 10 in. long. The bolts themselves are of plastic molded from an impact material. These moldings have a heavy resin content, providing an exceptionally smooth finish.

It will be noted that only phenolic among the thermoset materials—in both molded and laminated form—is recognized in textile machine applications. "Arbo-neeld," a dimethylolurea wood-impregnating material, made by E. I. du Pont de Nemours & Co., Inc., at Wilmington, Del., is used with urea to harden and stabilize wood for making shuttles.

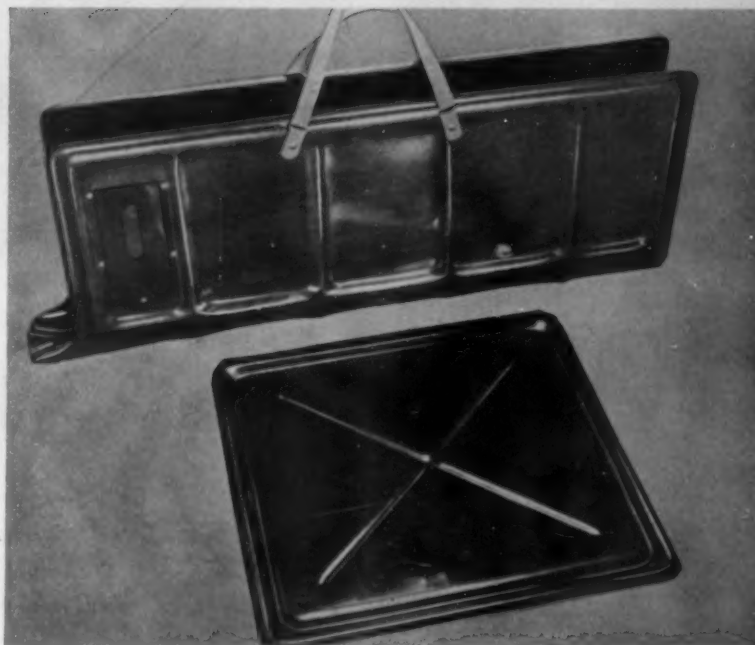
Only nylon among the thermoplastics is used in any quantity. Both cellulose acetate and polystyrene have been used in molding *fingers* and other small control parts of stop-motion devices, used largely on knitting machines. Acrylic safety shields and inspection boxes and panels are also used in hosiery mills.

Polystyrene was tried out in pilot plants as material for spinning buckets, but was not successful, we are given to understand. There is plenty of scope for development of thermoplastic applications in this field, provided it is done on the basis of engineering as in the examples given above.

#### Future textile machinery

Throughout the whole description above of the part plastic components are playing in the textile machinery field, one fact is very evident: the uses of plastics in this field to date have been limited chiefly to rayon and nylon production machinery, which, colossal as it is, is but a portion of the market available. Aside from acid resistance, most important in synthetic textile manufacture, plastics machine parts offer much to wool, cotton and other segments of the field. Because of constantly high labor costs and the need for ever-faster production, bigger and better new equipment is needed right now for the handling of those fibers.

The present article has been limited in its scope chiefly by its timing. Several very important new developments are shortly to be announced by textile machinery houses, textile manufacturers, plastics processors and material suppliers. They will be reported



PHOTO, COURTESY BAKELITE CORP.

14—A carrier for transporting hosiery from one part of the plant to another is postformed of sheet laminate stock

a few at a time in coming issues of MODERN PLASTICS.

#### Acknowledgments

The editors' thanks to the following companies for providing information presented in this article: National Vulcanized Fibre Co., Universal Winding Co., Bakelite Corp., American Insulator Corp., Durez Plastics & Chemicals, Inc., Westinghouse Electric Corp., The Clark Thread Co., Synthane Corp., The Formica Insulation Co., Joyce Machine Co., Liberty Throwing Co., Oscar Kohorn & Co., Ltd., Industrial Rayon Corp., E. I. du Pont de Nemours & Co., Inc., Plasticbilt Corp., *Textile World*, American Knitting Machine Co., General Electric Co., Plastics Div.: American Viscose Corp.



*This ultra-modern train, developed to test public reaction to many innovations in railroading, embodies perhaps the most extensive, imaginative use of plastics ever employed in a train. This train comprises a chair car, diner, sleeper, observation car*

## Plastics are tested for train interiors

*All plastic processes are represented in the train's accessories—  
coating, laminating, extruding, molding, forming, fabricating*

THOSE having an opportunity to examine the ultra-modern General Motors Train of Tomorrow during its exhibition tour of major United States cities will discover that it embodies perhaps the most extensive and imaginative use of plastics ever employed in a train. Developed by General Motors, the Train of Tomorrow comprises a chair car, dining car, sleeper and observation lounge car drawn by a General Motors, Detroit, Mich., 2000-h.p. diesel locomotive. The train was built by the Pullman-Standard Car Manufacturing Co. of Chicago, Ill., as a prototype to test public reaction to its many innovations. Even before initiating construction of the train, General Motors extended full permission to the entire railroading industry to make use of any of the new ideas it contains.

Among the plastics making their rail debut is Varlar wall covering material. This wall covering, made by a patented thermoplastic process, is the result of nine years of research and experimentation by United Wall-

paper, Inc.<sup>1</sup>, 222 W. North Bank St., Chicago, Ill. In the chair car, Varlar, in a plaid pattern of gray, orange, rust and light peach, covers the walls adjacent to the windows. In the dining car, the walls of the private dining room are covered in Varlar with a red, green and blue floral pattern. An even more extensive use of the material is in the lower section of the lounge car, where this covering graces a large wall section.

The properties of this wall paper particularly suit it for these new applications. Ink stains, pencil and crayon marks, lipstick, grease and oil spots are only a few of the soils which may be easily and completely removed from Varlar without damaging the material. It is also highly flame resistant and shows no wear or other visible effect other than a slight gloss after a 25,000-rub test in a Close washability tester.

Other new plastics making their initial railroad appearance in the Train of Tomorrow are V-board and

<sup>1</sup> "Wallpaper built on thermoplastics," MODERN PLASTICS 23, 140, 141, (Apr. 1946).



*Typical of the use of thermoplastic processed wall-paper and high pressure laminates in this train is wall covering and decorative table top in lounge car*



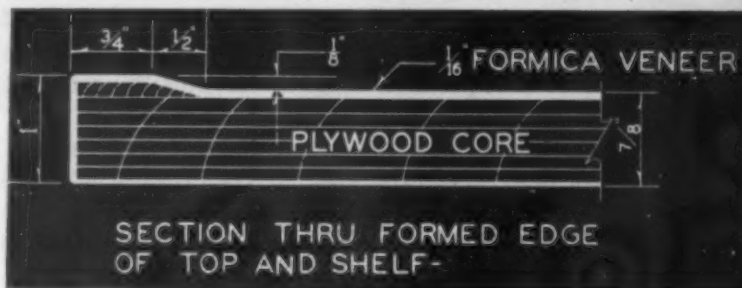
*The four Astra Domes depend to a great extent for success on the vinyl butyral sheet interlayer used in the safety glass that makes the core of the glazing on the windows*

Es-Es, both produced by U. S. Rubber Co., 1230 Ave. of Americas, New York City. The V-board is a contact pressure laminate based on either paper or cloth. Es-Es, a combination of synthetic resins in commercial production, is said to possess wearing qualities several times greater than any linoleum or similar product. The special Es-Es wear-resisting material is employed on this train on the lower portions of the coach car, to window height, to withstand rubbing from baggage and other hand material. It is also used for floor covering in the dressing rooms, toilets, vestibules, steward's section, and on a portion of the passageway walls of the chair car. It is made in a variety of colors.

V-board employed in the train is  $\frac{25}{1000}$  in. in thickness and has a hard, non-porous surface insuring long service life and facility of cleaning. The finished laminate is cemented in place on wood, metal or other smooth surfaces. The women's lavatory in the lounge car has two walls of V-board with an Adam-and-Eve pattern in yellow, gray and green and two walls painted light yellow and gray-green. The men's lavatory in this car has two V-board covered walls with a simulated matte finish. In the men's dressing room of the chair car, a large-patterned Gay '90s V-board covers two walls.

Long a familiar material in railway cars, Formica high pressure laminate appears in a number of applications on the Train of Tomorrow. All of the Formica used in the train was prepared expressly for these applications and many of the colors employed are new for the various uses. In table top surfaces for the diner and club car, Formica was supplied in green with inlay, and in green and Arabesque patterns. Other Formica uses in the train include hopper covers in solid red and blue, green and brown window capping (or sills) used throughout the four cars of the train, and a number of corner shelves supplied in black, blue, yellow and green.

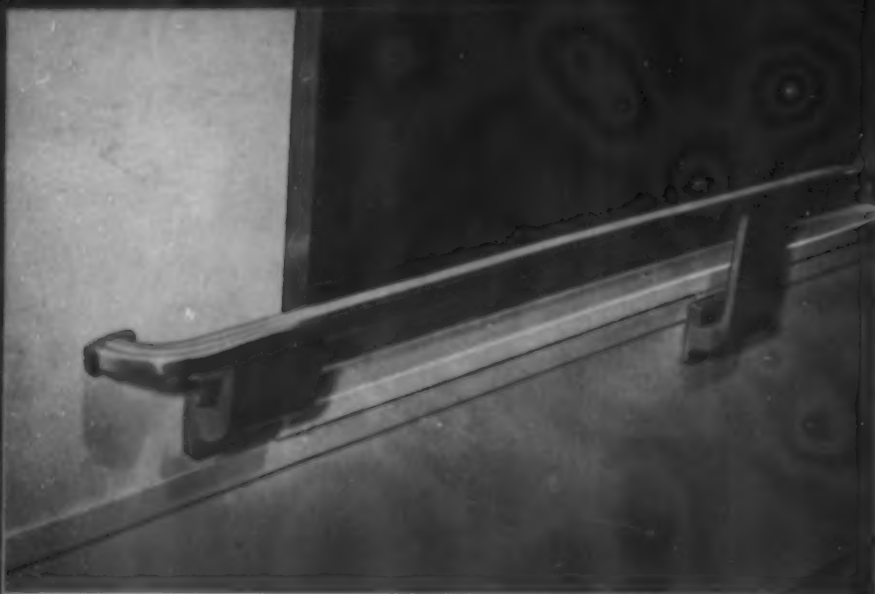
Formica panels on this train are used in conjunction with a plywood core, in accordance with prevailing practice. On some of the surfaces, however, a new type



*A new type formed edge is used on high pressure tables and shelves to prevent objects from gravitating off the top*

*Acrylic lighting diffusers, formed from  $\frac{1}{8}$  in. sheet material in translucent white, are used in ceiling of lounge*





*Curved aluminum hand rails in all four cars of the train and straight rails across some windows are improved in appearance by continuous extruded insert of cellulose acetate*



*Walls of this men's lavatory as well as those in men's dressing rooms in lounge car are covered with decorative contact pressure laminate wallboard*

of formed edge has been employed to prevent objects from gravitating off the table, shelf or other Formica-topped area. A cross-sectional view of this type of edge, with the  $\frac{1}{16}$ -in. Formica panel formed in such a manner as to produce a slightly elevated "plateau" at the edge, is illustrated on page 81.

One of the most important and extensive uses of plastic materials in the Train of Tomorrow is an application which passengers probably do not even realize is there. This is the employment of vinyl butyral in the Special Railroad Thermopane glass panels in four Astra Domes, measuring 30 ft. long and 10 ft. wide, and in the other windows used elsewhere on the train.

Produced by Libbey-Owens Ford Glass Co., the Astra Dome Thermopane units consist of outside sheet of heat-absorbing, glare-reducing polished glass, tempered for greatly increased strength, a  $\frac{1}{4}$ -in. dehydrated insulating air space, and an inner laminated safety glass similar to that used on automobiles, consisting of two heat-treated panes of  $\frac{3}{16}$ -in. plate glass with an interlayer of vinyl butyral plastic sheeting.

Itself  $\frac{1}{8}$  in. thick, the plastic layer is built of multiple plies of L-O-F regular automotive polyvinyl plastic with an additional layer of tinted polyvinyl filter material to reduce glare. The tinted plastic, developed especially for the Astra Domes, was evolved by the L-O-F research laboratory, working in conjunction with E. I. du Pont de Nemours & Co., Inc., and is made by du Pont. The regular polyvinyl material used in the Thermopane panels is supplied by both du Pont and the Monsanto Chemical Co. The railroad Thermopane used to glaze the windows of the main body of the cars is practically the same as that used in the domes.

Most of the lighting equipment in the train is of aluminum and glass, but in several locations circular diffusing shades of white translucent Plexiglas are employed for the circular fluorescent tube lights mounted flush against the ceiling. These attractive units, which harmonize with the modern decor of the train, impart a

soft, even illumination without eyestrain. Approximately 15 in. in diameter, the shades are of  $\frac{1}{8}$ -in. material. Semicircular in cross section, they completely enclose the fluorescent tubes. All major lighting equipment was supplied by Luminator, Inc., Chicago, Ill.

The beautiful appointments of the train include several applications involving fabricated Lucite. Prominent among these are the two large edge-lighted decorative panels on the rear wall of the dining car, set in curved aluminum frames, and four special edge-lighted acrylic clock cases with numerals and special Train of Tomorrow motif cut into the back. Specially designed for the train, the clocks and murals were executed by Clarence Newman of Detroit, Mich.

Also of Lucite is the edge-lighted "Top o' the Rail" sign in the observation lounge car. Above toilet room doors are small edge-lighted "In Use" signs of Lucite, supplied by Adams & Westlake Co., Elkhart, Ind. This company also supplied the gracefully curved aluminum hand rails used in all four cars of the train, as well as straight hand rails across some of the larger windows adjacent to the aisles. They gain improved appearance and more pleasing touch through use of continuous extruded insert of ivory Tenite, supplied by Detroit Macoid Co., 12340 Cloverdale Ave., Detroit, Mich.

Among the most modern innovations on the train are the so-called "ship to shore" radio telephone services. All three telephone handsets used for these services were injection molded of gray-green cellulose acetate by Western Electric Co., Chicago, Ill.

Wherever the passenger looks on this amazing new train, he is confronted by additional uses of plastics. In the dining car and dining car Astra Dome, food is served from Bolta Ware trays produced by The Bolta Co., Lawrence, Mass. In the washrooms, the gleaming black toilet seats, consisting of a wooden core with a compression molded overlay of cellulose acetate butyrate material, are supplied by C. F. Church Mfg. Co., P. O. Box 471 Holyoke, Mass.

# Plastics blameless in Los Angeles blast

**E**XPERT testimony and a verdict by a Coronor's Jury packed with outstanding local chemical and metallurgical scientists, exonerated plastics of blame for a devastating explosion in Los Angeles, last Feb. 20. Their combined opinions, as expressed in the jury's brief verdict, said that the O'Connor Electro-Plating Corp. disaster which took 17 lives, injured hundreds, and caused more than \$1,500,000 in property damage, was caused by some unknown occurrence.

News service accounts fixed the center of the explosion in an area formerly occupied by a large tank of perchloric acid to which acetic anhydride had been added. This potent mixture was being used in an electro-polishing operation said to have been developed by the company's chemist.

According to an employee who miraculously survived the explosion, although standing less than 100 ft. away from the perchloric tanks, a plastic frame covered with plastic screen had been submerged in the solution for the first time the morning of the blast.

"That probably caused the explosion," news accounts quoted a Los Angeles Fire Department official as saying. "Plastics are organic matter. If plastic went into the perchloric acid vat, there was bound to be an explosion," he stated.

Reaction to that alleged statement, as might be expected, was violent throughout the plastics industry, perhaps almost as violent as the Los Angeles explosion itself. For here, once again, a loose and misleading statement was attaching stigma where it did not belong.

Realizing the implications of such blanket condemnation of plastics, and the potential injury it might impose on the industry, MODERN PLASTICS Magazine asked leading chemists throughout the industry for their opinions and comments. To a man they replied that it was extremely doubtful that plastic itself would trigger such an explosion.

To a man they replied that the use of perchloric acid, even without the addition of acetic anhydride, is extremely dangerous, and as compounded by the Los Angeles man was even more so. The remarkable thing, they said, is that there was not an explosion before.

The Los Angeles Coronor's Jury agreed in these words: "... The cause of the explosion was the use of a process for the electrolytic polishing of metal objects involving the use of considerable quantities of perchloric acid and acetic anhydride which exploded as the result of some occurrence which is not specifically known.

Published more than three months after the event, this report which exonerates plastics for any blame in the February 20 explosion in a Los Angeles electroplating plant, was delayed until MODERN PLASTICS Magazine could bring the full facts, as revealed at the inquest, to its readers supplemented by facts gathered independently from the industry and from impartial chemical experts.

This occurrence may have resulted from contamination of the solution by sensitive or easily oxidizable materials or may have resulted from some operation in progress at the time of the explosion. This process calls for the use of electric current and utilized refrigeration. Evidence was presented to show contamination of mixture could and did occur."

The O'Connor Co., according to inquest testimony, began using

the perchloric-acetic anhydride-electrolytic process early in September 1946. It had been "developed" by Robert M. Magee, who had been hired as a chemist, and was general supervisor of the plant. The inquest verdict commented:

"The said corporation employed Robert M. Magee on the basis of statements made by him as to his previous training which were shown to distort the facts.

O'Connor's new tank was constructed of 10-gage stainless steel and had been spray coated with a  $\frac{1}{64}$ -in. thick layer of "Bakelite," which had then been baked. In the tank was a Bakelite coated, stainless steel coil through which a brine refrigerant was pumped from a centrally located cooling system that served all of the processing tanks requiring cooling in the plant. Agitation of the acid solution was achieved by compressed air taken from another central or plant-wide system. Electrodes, which passed 18 volts of current through the solution, were shielded with Saran screen wrappings.

When aluminum disks dropped from racks during operations on the first day (Monday, Feb. 17) the new tank was used, and their recovery was found difficult, Magee ordered a rack to fit in the bottom of the tank. A frame was fabricated of extruded Tenite II rod, covered with Saran screen.

Plastics-wise, the most important testimony brought out during the inquest came from an expert witness, G. L. Cheney, chief chemist of the Smith-Emery Co., Los Angeles chemical analyses firm. Cheney testified that at the request of the fire and police departments, he made tests with a solution he believed approximated that used by the O'Connor firm. From them he found:

That Tenite II is soluble in acetic anhydride. That the amount of Tenite II in the frame previously mentioned, if entirely dissolved in the amount of perchloric-acetic anhydride being used at the O'Connor plant could not of itself have been serious. But that it might have sensitized the solution to a point where it would be more susceptible to detonation. In his experiments, Cheney could not get the perchloric solution containing dissolved Tenite II to detonate.

# PHENOLIC adapter rings solve motor bearing problem

*Medium-impact flock-filled molded phenolic adapter rings were found more economical than fabricated steel adapters*



PHOTOS, COURTESY DUREZ PLASTICS & CHEMICALS, INC.

*The problem in molding these phenolic adapter rings for DC motors was to find material that would not flow between bearings and mandrel. A medium-impact phenolic was the answer. Adapters are shown with and without felt cover pad*

**P**HENOLIC plastic adapter rings proved to be the answer to a knotty problem faced by the Kato Engineering Co. in meeting a customer's specifications for DC motors. The original design of the motor as evolved by Cecil H. Jones, company president, called for sealed ball bearings. An order received for a large number of these motors for use in electric refrigerators specified that sleeve bearings were to be used.

Since a large number of the regular pressed steel end bells used on the motors were left over from a terminated war contract, it was desirable to adapt the same end bells to the new type bearing. The first adapter developed was fabricated from steel. When the quantity desired was increased, the steel construction was found

to be uneconomical. After considerable experimentation with various materials, a Durez phenolic plastic was found by company engineers to be particularly suitable for the application. The Central Machine Works Co., 1234 Central Ave., Minneapolis 13, Minn., is now molding the adapters. The bearings are molded in as integral parts of the pieces.

Oilite sleeve bearings are being used. These are

very porous and are impregnated with lubricating oil. Four molded-in felt retainer cavities extending part way through the hub surround the bearing. The retainer cavities contain strips of felt saturated with oil which seeps through the bearing. A felt washer covers the ends of the felt strips. Tests indicate that with this arrangement, lubrication will be required but once every two years after the motors are in operation.

#### A medium-impact material

Small notches are ground into the outer circumference of the bearings to assure proper anchorage to the material. The inner ends are tapered to prevent the molding compound from flowing between the bearing and the mold mandrel during the molding operation. A woodflour-filled general purpose Durez material was first specified for these adapters. Having a long flowing period, it persisted in flowing between the bearings and the mandrel which, of course, deformed the bearing. A medium-impact flock-filled material with a relatively

short flow time is now being used which, in conjunction with the tapered end, has licked this problem.

Before installation, the adapters are mounted on a lathe mandrel and a truing-up cut made on the hub and the inside flange. This operation properly aligns the bushing and makes it concentric. A slow-up in motor assembly was anticipated because of the usual difficulty in securing proper alignment and fit of the bushings. It has been found, however, that the bushings in their molded adapters line up very well and are completely satisfactory from a production viewpoint.

Large numbers of these Durez adapters have been put into the field and have established excellent service records to date. Life tests being conducted by Kato indicate that such performance can be expected for a long period of time. Should replacement ever be necessary, either new sleeve bearings or ball bearings can be fitted into the end bells by simply removing three machine screws. This is a definite improvement over the more conventional pressed-in type of bearing.

**VIOLIN SUITE, SCARLET STREET AND Dance Macabre** are three perfume packages that reach new heights in exotic appeal without the sacrifice of serviceability. In each of these, the perfume manufacturer, Sherry Dunn, Inc., has specified Lucite as the package material—except for the glass containers for holding the perfume.

The sparkle-studded violin-shaped base and the stopper of Violin Suite are made of acrylic as are the base and stopper of the bows which are sold with the violins and may be carried as purse perfume vials.

Bases for the Scarlet Street and Dance Macabre packages are fabricated of black Lucite while the lamp of the first mentioned package and the dagger handle of the second are clear acrylic. In the case of the dagger handle, sparkles are again used to enhance the appearance of the piece.

Feeling that a great deal of money is spent by women each year for elaborate and expensive containers, the perfume manufacturer designed all of these packages so that refill vials—purchased at a fraction of the complete unit cost—may be inserted into the permanent base. This in no way affects the original design and the piece continues to be a dressing table ornament.

Continental Plastics of Los Angeles, Calif., hand fabricates the acrylic parts for the Macabre, Violin Suite and Scarlet Street containers; International Plastics Corp., of Glendale, Calif., fabricates some of the plastic parts employed in the Scarlet Street cologne package.





*The weld line, which is ordinarily a point of weakness, is entirely eliminated in this tableware, giving it good strength properties. All pieces are injection molded in 4-cavity dies and a high rate of production is maintained. Cups require the longest molding period because they involve two thicknesses—a 0.090-in. thick cup and a 0.115-in. thick handle—and removing from the mold can cause one part to cool faster than the other*

## WHY polystyrene tableware?

**F**OR some time polystyrene tableware has been considered to have great possibilities in the field of low-cost dishes. Today, it is being given an additional boost because of the shortage of low priced chinaware and pottery. As a result, chain stores are eyeing with great interest the work being done in this field.

Molders admit that this tableware is at present a stop-gap, but almost immediately contradict this assertion by claiming that all tableware articles made from polystyrene will last just as long as any low cost chinaware and that when the newly developed heat resistant polystyrene is readily available, the polystyrene dishes will be quite superior to the chinaware which is found in popular priced retail outlets.

### **Other advantages over chinaware**

Besides superior wearing qualities, polystyrene dishes have low heat conductivity, will not absorb water and are practically acid and alkali resistant. They also will not break as easily as chinaware.

The heat conductivity of polystyrene is such that a coffee tipler can drink boiling hot coffee out of a cup that is comparatively cool on the outside. Developers admit that a cup, for example, may not last more than two years—but neither does the ordinary kitchen or dining room chinaware. The cups will eventually crack due to the contraction caused by constant heat from boiling

hot coffee, but dining utensils made of all other familiar materials will chip, crack or otherwise become useless.

### **Too light for restaurant use**

At the present time, polystyrene is not recommended for restaurant ware because it is not heavy enough. But there is the entire home field open to this plastic. Incidentally, it is generally recognized that a dish that lasts one month in a restaurant lasts two years in a home.

In the home, polystyrene tumblers have been found to be particularly convenient in bathrooms where they have proved that ordinary abuse such as falling from a washstand will not cause breakage. They cannot be thrown against a wall or subjected to similar unusually severe treatment, but for ordinary purposes they will stand up a long time. Producers recommend that, for cleaning, polystyrene dishes simply be purged or scalded with hot water in the same manner as glassware. It is neither necessary nor advisable to put them in dish washers with heavy dishes and soapy water.

### **Eight-oz. injection machine used**

Typical of the work being done in the polystyrene tableware field is that of Alladin Plastics Inc., 2438 East 55th St., Los Angeles 11, Calif. This company uses an 8-oz. injection machine with 4-cavity die to mold its dishes. The tumblers can be molded at 140 shots an



*An inexpensive set of tableware, too light in weight for restaurant use but ideal for the home, is available in six pastel shades and crockery colors that cannot be distinguished from actual crockery. The variety of decorations that can be obtained is unlimited*



***Low heat conductivity, resistance to acids, alkalis and to breakage explain popularity of polystyrene tableware***

PHOTOS, COURTESY ALLADIN PLASTICS, INC.

hour, the cups and saucers at 120 shots an hour and the cereal bowls (which are thicker) at 80 shots an hour.

The cups are slower than the tumblers to produce because in these pieces two thicknesses are involved—a thickness of 0.090 in. for the cup itself and a 0.115 in. thickness for the handle. The cup must stay in the mold for a longer period of time because the thinner section would chill faster than the handle or thick section, if removed from the mold too quickly, and leave a sink mark.

This molding company points to the total absence of visible weld lines on its product and asserts that this is the reason its dishes are strong enough to withstand average abuse. Ordinarily, the weld line is a point of weakness.

The absence of a weld line is a result of special construction of the mold. Careful study was given to the position of the cavities, and also the location of the gates. The gates were located so that a steady flow of material would fill the mold cavities evenly—a feature, of course, which is desirable at all times. Weld lines and flow marks are overcome in this manner.

The Alladin company has developed a clipper to remove gates and sprues, thus doing away with expensive jigs and fixtures. These cutters are made of a good grade tool steel. Cutting edges are hollow ground and hardened so that a clean close cut is always made and no

additional finishing operation is required for the ware.

The cutters are put together with a tapered head screw and lock nut so that any wear can be compensated for and so that the cutting edges always match evenly, thereby insuring good workmanship. Another feature is the adjustable stop which prevents the cutting edges from being damaged by continual use.

Considerable expense was involved in making a forging die for these cutters which are now being offered to injection molders at a nominal price. The company found that after making numerous cleaning fixtures ranging in price from \$50 to \$300, these cutters did a more satisfactory job than more complicated cutting jigs and fixtures.

#### **Wide color range available**

At present, the dishes are being offered in six pastel colors and in crockery shades which imitate fiesta colors so closely that from a distance they cannot be distinguished from actual crockery. Almost any type of decorative effect can be obtained.

When first produced, the dishes were sent out in 12 dozen lots to distributors in all parts of the country. In less than a month, requests were coming back for double to five times the original shipments. The cups and saucers retail for 29 cents each, the cereal dishes for 19 cents each and the tumblers for 10 cents each.

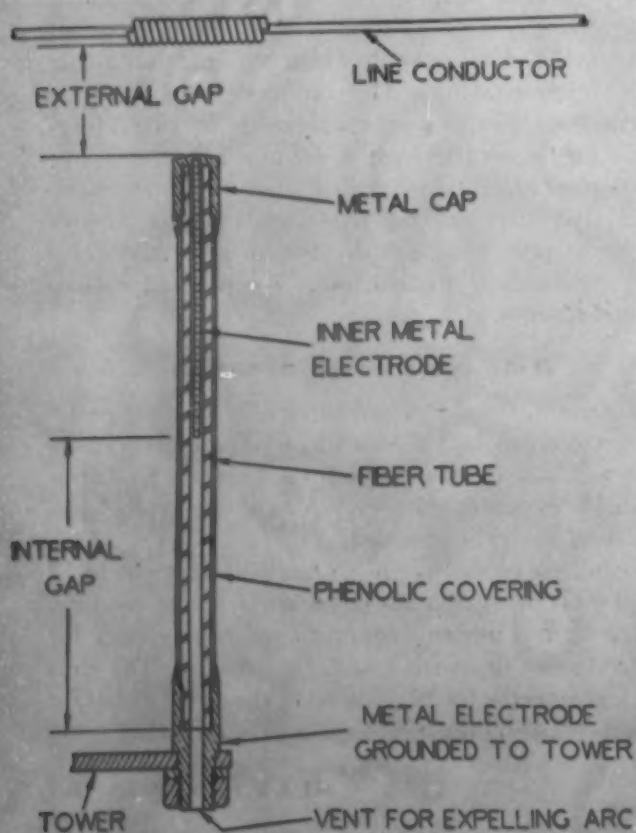
# Vulcanized fibre in arc



PHOTO, COURTESY BUSSMAN MFG. CO.

1—Typical of the use of vulcanized fibre in indoor fuse cartridges, is this cartridge of the super-lag type  
2 (Below) When used for outdoor high voltage fuses, the fibre tube gets a protective cover of laminated phenolic

DRAWING, COURTESY GENERAL ELECTRIC CO.



**E**XCELLENT electrical and mechanical properties, exceptional toughness, good machining characteristics, which include easy sawing, drilling, punching, turning, threading, tapping, broaching and shaving, explain the ever widening popularity of vulcanized fibre in the electrical industry since this material was first patented in 1859. Electrical insulation, one of vulcanized fibre's first uses, is today the outlet where it serves as the chief plastic insulating material not only to withstand but to extinguish live arcs. Typical of these electrical insulation applications are fuse cartridges for indoor and outdoor use, switch barriers, disconnecting switches and lightning arresters.

Basically, vulcanized fibre is a converted cotton cellulose. It is made by laminating plies of special chemically reactive cotton paper with the aid of a chemical—zinc chloride—which is later leached out to produce a pure, hardened, tough, cellulosic material.

## Theory of arc extinction

Vulcanized fibre has three distinct characteristics that make it the indispensable material for use as electrical insulation in arc interrupting devices. These are: 1) arc resistance, 2) neutral gas forming, 3) mechanical strength. To understand the importance of these properties it is necessary to discuss briefly the theory of arc extinction.

An air space supporting an arc is conducting due to the disassociation of "ionization" of the air particles. Ionized air will normally lose its ions if left to itself because the oppositely charged ions combine to form neutral molecules. This natural recombining of ions in an arc stream is too slow, however, for practical use and other means for accelerating this recombining are resorted to.

A practical means for accelerating the rate of de-ionizing is to bring surfaces of solid insulating materials close to the arc so that ions may collect on these surfaces and there recombine to form neutral gas molecules. The kind of insulating material which is brought close to the arc has a big effect on extinguishing the arc. A material which decomposes into a neutral gas under the heat of the arc is much more effective than a refractory type material such as glass or porcelain. Vulcanized fibre is such an ideal insulating material because it evolves sufficient quantities of neutral gases, including water vapor, under the heat of the arc.

The gas which is evolved by the arc is neutral—or, un-ionized—and produces a turbulence, mixes with the ionized air in the arc stream, thereby accelerating the recombining of the ions to form neutral molecules. In

\* Sales and development engineer, National Vulcanized Fibre Co., Wilmington, Del.

# interrupting devices

by GERARD A. ALBERT\*

**Chief reasons for use of vulcanized fibre in these devices are: arc resistance, gas forming and strength**

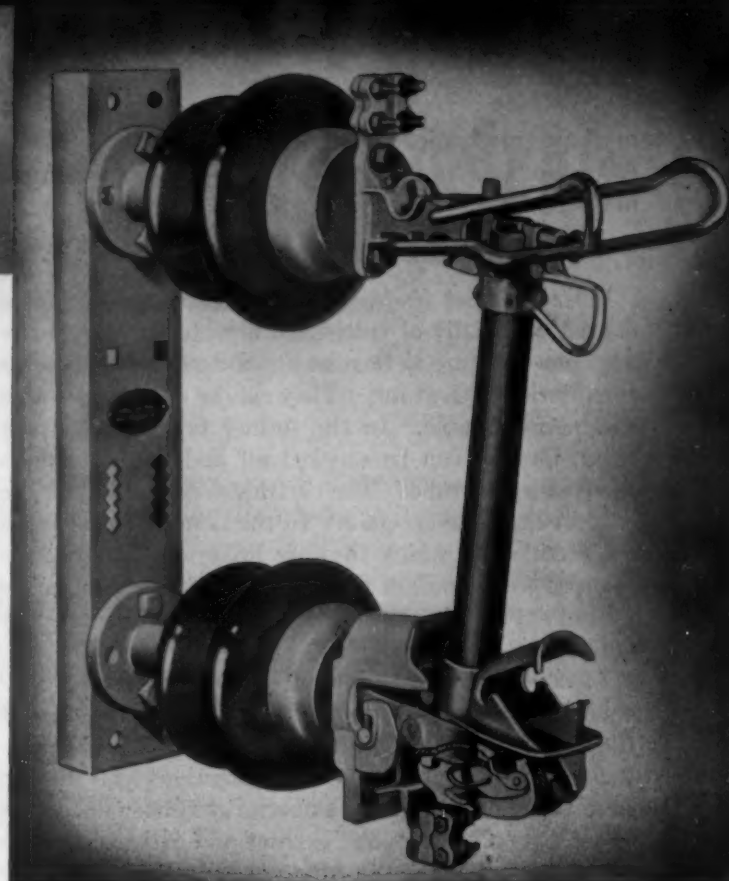
addition, the large amount of this rapidly evolved gas, in the case of the fibre tubing, physically blows the ionized air stream from between the terminals to the outside of the tube. This action is referred to as the "expulsion" principle.

## Three chief characteristics

**Arc resistance**—Vulcanized fibre is one of the most arc resistant (that is, difficult to carbonize) plastic insulating materials available. When used in properly designed devices both small and large currents are played on it without leaving the extremely objectionable surface deposited carbon. This is true because vulcanized fibre is a cellulosic material and has a sufficient oxygen content in its molecular structure to unite with its carbon to form the neutral arc interrupting gases. This gas in turn tends to protect it from carbonization or tracking by keeping the arc away from its surfaces. Some commercial expulsion-type lightning arresters employing fibre tubing as the active elements withstand many surge currents of over 100,000 amperes without leaving a trace of deposited carbon in the arrester after the discharge.

**Gas forming**—The gas evolved from fibre due to an electric arc consists of approximately 50 percent carbon monoxide, 45 percent hydrogen and 5 percent mixture of hydrocarbon gases besides water vapor. It was noted from laboratory tests made on fibre tubes of  $\frac{1}{2}$  in. inside diameter that 2500 amperes at 60 cycles decomposed approximately 0.25 grain of solid fibre to each one-half cycle of the arc.

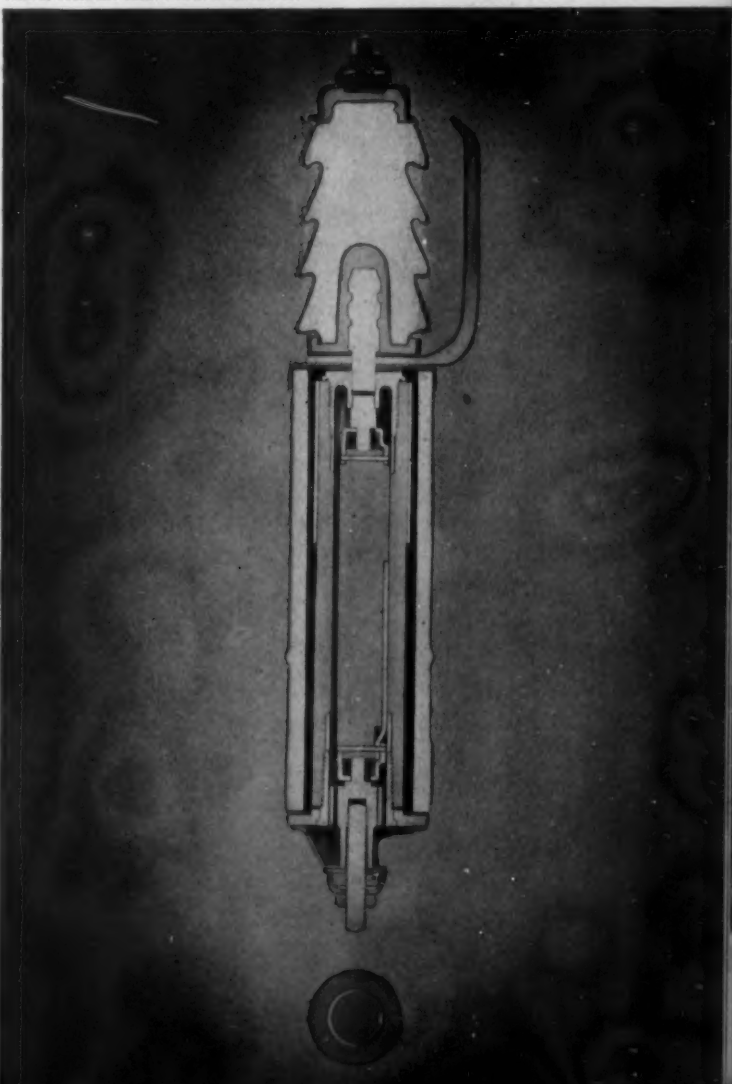
**Mechanical strength**—When an electric arc generates gas from the interior of a fibre tube, tremendous spontaneous pressures are set up. These pressures not only tend to rupture the wall of the tube but also to strip the threads of the tube holding the metal end plugs. The mechanical forces that are set up are shock or impact stresses. Fibre under steadily applied stresses has strengths comparable to those of many other organic insulating materials, but its impact strength or shock resistance is from three to seven times greater. At normal moisture content the Izod impact strength of fibre is 7 ft.-lb. per in. notch. In addition to its re-



PHOTO, COURTESY LINE MATERIAL CO.

3 (Above)—Combination vulcanized fibre-phenolic fuse tubes, like this protected cut-out type, come in a wide variety of lengths, diameters and wall thicknesses  
4 (Below)—Lightning arresters make wide use of this fibre

PHOTO, COURTESY JOSELYN MFG. & SUPPLY CO.



markable mechanical strength, vulcanized fibre will not soften and lose its strength under the high temperatures of electric arcs.

#### **Vulcanized fibre applications**

*Cartridge fuses (indoor type)*—Indoor cartridge fuses consist essentially of vulcanized fibre tubes whose ends accommodate metal ferrules for mounting the fuse in the interior of the tube. They can be either renewable and nonrenewable. In the former type (Fig. 1) the metal ferrules can be screwed off and new fuse links inserted in the tube. The cartridges can, of course, be used over and over again. In the nonrenewable types the ferrules, to which the fuse links are soldered, are crimped to the ends of the fibre tubes and cannot be removed. For this reason this type of fuse is used only one time.

*Lightning arresters*—One of the biggest uses of vulcanized fibre tubing in arc interrupting devices is for the manufacture of lightning arresters. The fibre in these devices performs the same functions as it does in fuses; that is, it produces a neutral gas under the action of the lightning discharge current and extinguishes the power follow current in order to completely clear the electrical circuit.

A high current capacity type lightning arrester is shown in Fig. 4. This device consists essentially of a fibre tube filler mounted inside a heavy wall fibre tube such that the filler is in contact with the inner wall of the enclosing tube. Since an electrode is mounted in the filler tube, it is brought in contact with the wall of the enclosing tube. This internal electrode is shorter than the filler tube, thus making an internal gap in the arrester. To protect the fibre tubing from the weather, it is completely enclosed in a porcelain tube. An external isolating gap is added so as not to have the fibre tube permanently stressed with the line voltage which would cause current leakage and eventually flash-over. With a lightning stroke the external and internal gaps both spark-over, and an arc occurs between the end of the electrode inside the tube to the tower mounting, allowing the stroke to be dissipated to ground. It is this electric arc which generates a gas from the vulcanized fibre tube to interrupt the arc and, in this way, clear the circuit.

#### **Vulcanized fibre-phenolic tubing uses**

*Cartridge fuses (outdoor type)*—The larger outdoor high voltage fuses must, of course, be so constructed to protect the fibre tubes from the weather. They must also have a vent of sufficient size to allow the escape of the larger quantity of gas evolved by the electric arc when the fuse link blows (Fig. 2).

To protect vulcanized fibre tube from the weather, a method was perfected whereby the fibre tube is covered with laminated phenolic, which has excellent weathering properties. This is done by using the fibre tube as a mandrel and winding over it phenolic paper to the desired thickness. The built-up combination must be heated several hours at elevated temperatures to

cure the phenolic sheath. This necessitates proper preparation of the fibre tube so that it will not be injured by the heat. Furthermore, proper conditioning of the fibre tubes before they are covered is insurance against their shrinking and falling out when in service. A tube consisting of a fibre liner and a phenolic outer sheath is known as a combination tube.

*Combination-type cartridge fuses*—Present designs of combination vulcanized fibre-phenolic fuse tubes vary considerably in length, inside diameter and wall thickness, depending upon the voltage and current rating of the device. Since the maximum practical commercial wall thickness of fibre tubes is  $\frac{5}{16}$  in., one tube is telescoped into another if thicker walls are required. The outer tube is, of course, protected with a phenolic sheath. These telescoped tubes have inside holes as small as  $\frac{1}{4}$  in. with the outside diameter as large as  $1\frac{7}{8}$  inch.

There are two different types of combination fuse tube mountings. One is so built that when the fuse link blows, the tube drops, thereby disconnecting itself from the circuit. This is called the drop-out type. The other mounting type does not allow the tube to drop out when the fuse link is interrupted but keeps it connected to the circuit (Fig. 3).

*Tube coatings*—Fibre-phenolic combination tubes have excellent weathering characteristics and are free from warpage, but organic materials cannot, of course, be expected to have a life comparable with such inorganic materials as either glass or porcelain. No coating for these combination tubes that has so far been tried lasts longer than a few years, which is far shorter than the life of the tube itself. Furthermore, the best coatings that can be obtained are put on with the aid of baking to polymerize the resinous coating, and this baking operation causes considerable damage to the vulcanized fibre liner in reducing its mechanical strength and reducing its normal moisture content. For these important reasons, the trend now is to use fibre-phenolic combination tubes for the drop-out type holders without any lacquer coating. The expected life of such tubes is 20 years. With the non-drop-out type, however, the tubes will flash-over under adverse weather conditions, if the outside surface of the tubes doesn't have good electrical properties, and coatings do increase these properties. Unfortunately these effective coatings have very poor life and the fuse tubes must be removed from the line and recoated every year.

*Interrupter switches*—A considerable amount of vulcanized fibre-phenolic combination tubing is used in the manufacture of disconnecting or interrupting switches. These are switches for opening high voltage circuits without producing external arcs at the switch contacts. These devices employ a combination tube with a fused element mounted in the interior and so attached to the switch that as it is operated an arc is drawn on the inside of the tube where it can be instantly interrupted by the gas-evolving property of the vulcanized fibre lining in the tube.

# Atom smasher uses low pressure laminate

***Synchrotron employs 10 plastic parts—one measuring eight feet in diameter and weighing 650 pounds***

**A** 650 POUND plastic part is to be used as a component of the University of California's newest atom smasher. It is said to be the largest plastic article ever produced by General Electric's Plastics Division, Pittsfield, Mass.

This part together with nine additional G-E plastic parts; will form the vacuum chamber of the atom smasher. The physical properties of the plastics offer an unusual strength-weight ratio and good dimensional stability combined with electrical insulation.

General Electric's contribution to the synchrotron design consisted of seven rings and three vacuum manifolds made of a low pressure laminated construction to form the vacuum chamber in which electrons are accelerated. The rings were designed to bear the compressive load of the magnet.

The plastics rings were made of layers of glass fibers bonded with a polyester resin. They are produced either in a tube rolling operation or by self-contained bag molding. In the first process the impregnated

material is mandrel wound under tension and is cured in an oven, utilizing this tension as its molding pressure. In the bag molding method the material is wound on a male form and the assembly enclosed in a rubber bag. Heat is applied through channels built into mold after molding pressure of 14.7 p.s.i. has been developed. The manifolds are cured under a vacuum bag in a conventional autoclave.

After molding, the plastics parts were machined at the Watervliet, N. Y., Arsenal and returned to Pittsfield, Mass., for assembly and further treatment with the varnish to augment the vacuum tightness, strength and density.

According to University of California scientists, the new synchrotron is designed to produce a beam of 300,000,000 volt X-rays and combines certain features of the cyclotron with those of the betatron. Weighing less than either of the other two types, the new atom smasher can consequently explore the nature of materials with higher voltages.

PHOTO, COURTESY GENERAL ELECTRIC CO.

*Layers of glass fibers bonded with polyester resins form the low pressure laminate used in the 7 rings and 3 vacuum manifolds of the synchrotron in which electrons are accelerated*





◊ A safety first insurance for the most fragile of glassware and china is guaranteed by this practical dish drainer which is coated with Koroseal. This flexible vinyl chloride will withstand both fats and oils, is not affected by soap, remains clean and will not become sticky even after it has been subjected to continuous kitchen service

Addresses of all companies mentioned on these pages may be found on page 161

## PLASTICS



Elimination of sewed or cemented seam is accomplished in these dress shields made by RC Products, Inc. An electronically sealed Geon film forms a strong tear resistant inside cover for shield; material is impervious to moisture, acid and alkalis



A steel fishing rod, with the play of bamboo, uses serrated, grooved Tenite handles for comfortable non-slip grip. The six cellulose acetate parts are cemented, turned, knurled, positioned on aluminum die cast handle by Orchard Industries, Inc.

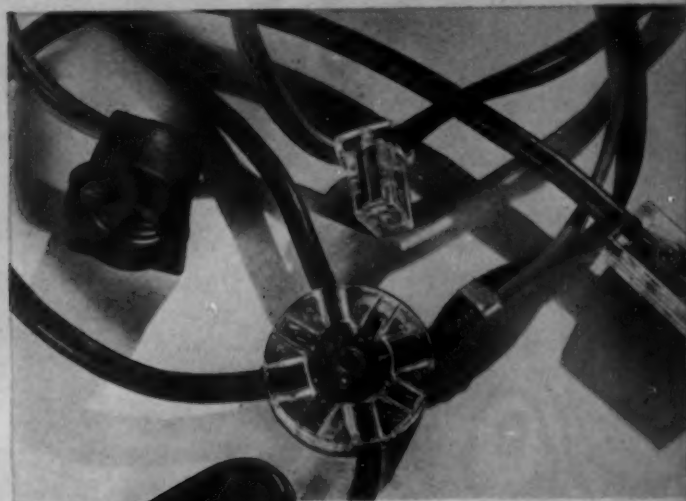
Visible selection of bait is possible with a transparent Styron live bait box which can be attached to fishermen's belts. It is injection molded by MacDonald Mfg. Co. for Progressive Products Co. Slotted top is rubber





Case and head of this Flashholder, designed for use on any Eastman Kodak Co. camera equipped with built-in flash synchronization, are molded of black and gray Tenite II by Waterbury Companies, Inc. Case holds two size "C" flashlight batteries and screws on to head

A flexible Vinylite light socket and a Bakelite polystyrene plug connection are used by Interstate Mfg. Corp. in their refrigerators because these materials have good electrical properties and resist moisture at low temperatures. Amos-Thompson Corp. molds parts



## PRODUCTS

Cleavers for the housewife are feminized with colorful lightweight Tenite II or ethyl cellulose handles molded by Franklin Plastics Div., of Robinson Industries, Inc., for Chas. D. Briddell, Inc.



No need for soiled make-shift brown covers for library books since the introduction, by Packaging Films, Inc., of a transparent Lumarith and paper jacket. Easy to slip on, these covers have a breakproof reinforced edge



Edge-lighting properties of acrylic are used to advantage in shears display made by Lakeside Plastics Co., for Metroloy Corp. Metal base, housing fluorescent light, is sprayed with Claremont Waste Mfg. Co. rayon flock

# PLASTICS

A completely waterproof covering for outdoor furniture or for pieces being stored is manufactured in sizes ranging from easy chair to large sofa by Vitaplast Products, Inc. The transparent Vinylite sheeting, 2, 4, and 12 gage, is bound with cotton tape stitched inside to give additional strength and more finished appearance



With these Trim Electric scissors, the hard work is taken out of cutting all fabrics. Housing of the vibrator-type motor is molded of Durez by the Molded Insulation Co. for Atlas Instrument Co., the manufacturer

*Addresses of all companies mentioned on these pages may be found on page 161*



The purity of White Rock Corp. beverages is thoroughly guaranteed against any contamination, despite long periods of storage, by bottle cap liners which are made of a Vinylite resin-coated paper. The properties of this material make it especially adaptable for use in this closure liner because it is non-toxic, also tasteless, odorless and chemically inert

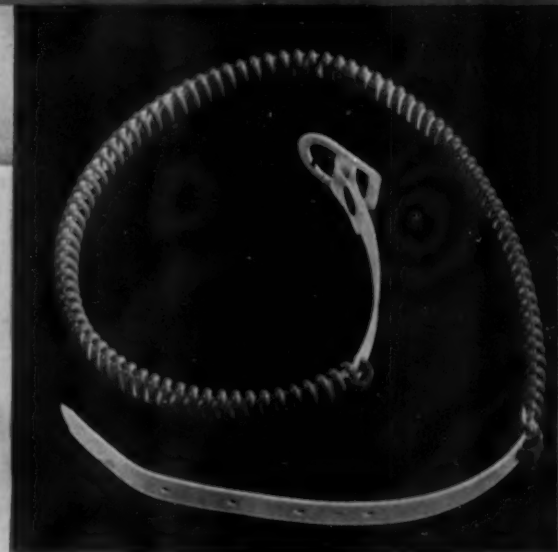
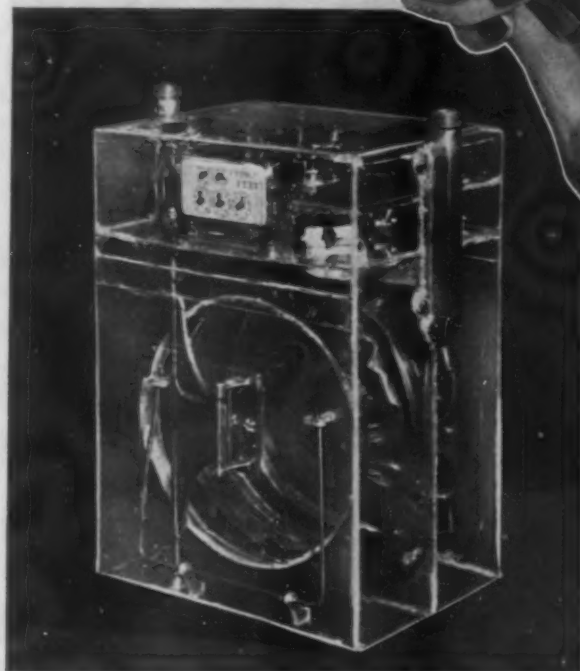


Juggling ice cube trays is a thing of the past if the housewife equips her refrigerator with a Roto-Tray which is manufactured by Republic Molding Corp. Molded in one piece of Bakelite polyethylene, the tray may be flexed at any angle to extract cubes. The tray will not become brittle at temperatures as low as  $-30^{\circ}\text{F.}$ , nor will it stick to refrigerator parts. Non-toxic property of polyethylene makes tray safe for food storage

# PRODUCTS

A fitting companion to frosted drinks on a summer evening is this Plexiglas tray which is being manufactured by Ranger-Tennere, Inc., for Cara Sales Corp. A variety of designs are available. They are silk screened in permanent inks on the back of the trays and are made in forming jigs. All edges of trays are highly polished

No more verbal or fluid explosions with this plastic pump which was designed by Pump-It, Inc., to dispense ketchup easily from any standard size ketchup bottle. Barrel, plunger and head are molded of red transparent Lustron; tube is clear Lustron; the cap liner attached to bottle is neoprene rubber; spring is stainless steel



Four plastic materials collaborate in an attractive belt of Tauber Plastics, Inc. Spiral coil and Tauber Multi-Rings are cellulose acetate, belt ends are polyethylene, buckle is casein, strip under coil is vinyl

This transparent standard metal gas meter used for instruction purposes by Public Service Electric & Gas Co. is composed of 128 parts—80 of which were cut and formed manually of Lucite. Brass parts were used for the rest of the model in order to improve its visual characteristics

Hors d'oeuvres, a drink, cigarette and ash tray can be held in one hand thanks to Naltex party trays molded of polystyrene in pastel blue, red, green and transparent. Nalle Plastics, Inc., molds them with ripple effect



# MELAMINE soda

**1** CONCEALED beneath the stainless steel and chrome plated exterior of modern soda fountains produced by Weber Showcase & Fixture Co., Inc., 5700 Avalon Blvd., Los Angeles, Calif., is a plastic solution to a problem as old as the ice cream soda itself—melamine fountain jars.

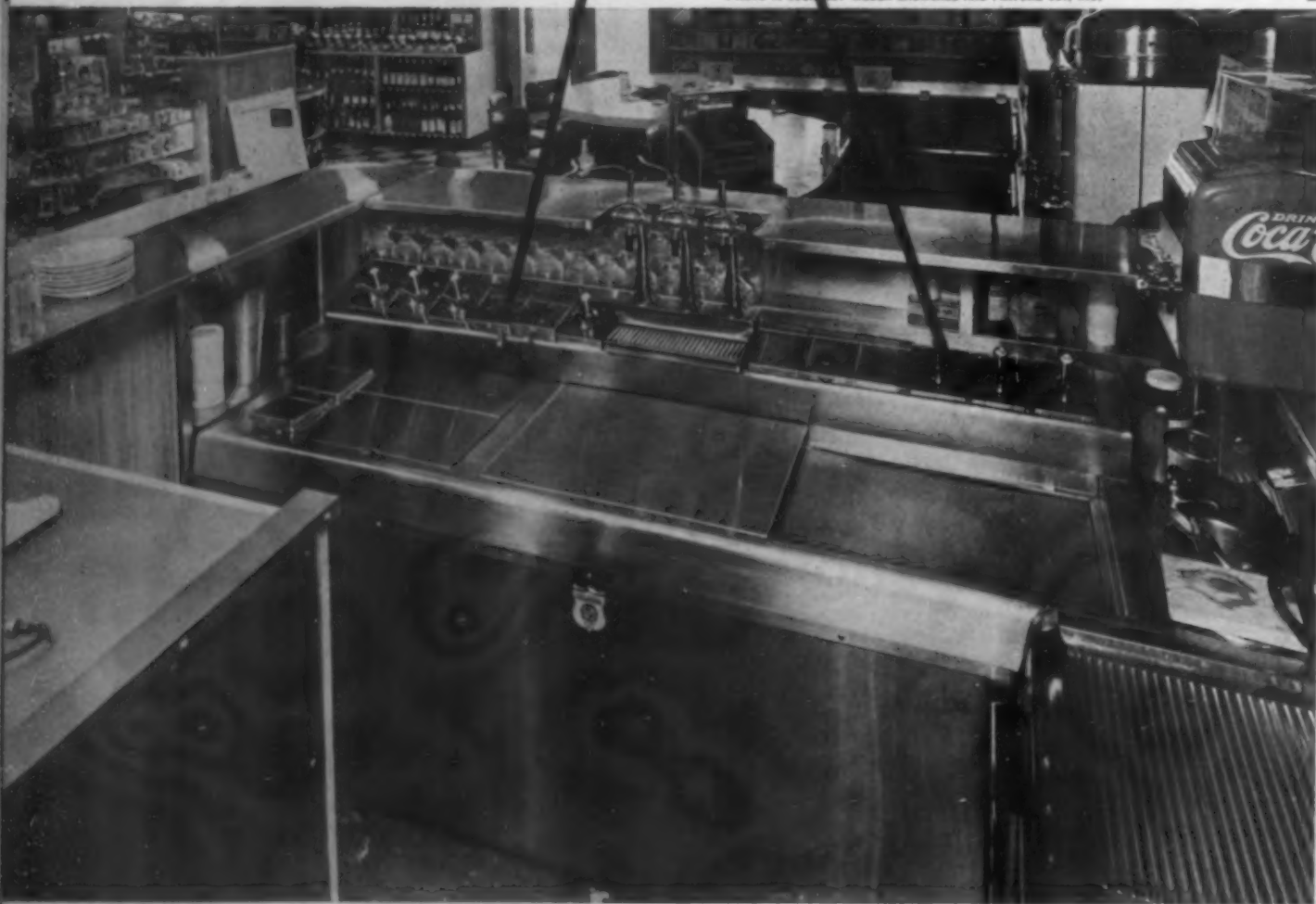
Sanitation requirements inherent in the dispensing of sticky, fermentable syrups and crushed fruits necessitate frequent removal of containers, ladles and pumping mechanisms for cleaning. For a long time this operation posed the costly problems of breakage, material loss and clean-up time after a dropped jar had converted a busy section into a potentially unsanitary mess.

Originally made of crockery, which was heavy and easily broken, the Weber fountain jars evolved through stainless steel, which was lighter and unbreakable but subject to denting, to plastic which has none of these ob-

**1 (Left)**—Soda fountain jars molded of melamine solve problems of breakage, sanitation and excess weight. **2 (Below)**—Here, the plastic jars replace stainless steel

PHOTO 1, COURTESY WEBER SHOWCASE AND FIXTURE CO., INC.

**2**



# fountain jars are useful and sanitary

jectionable characteristics. Besides being light and resistant to breakage and denting, the melamine jars cost less than those of stainless steel. Cost of the plastic jars is about 300 percent less than that of welded stainless steel, and 35 to 40 percent below quotations for jars deep drawn from a single sheet of that metal. Approximately  $4\frac{1}{2}$  by  $5\frac{1}{2}$  by  $11\frac{1}{2}$  in. in size the jar has a wall thickness of 0.175 in. which has been found sufficient to withstand such extreme shocks as those induced when the jar is dropped, full of heavy syrup, on the floor or sharp edges of the fountain.

There are two types of these jars that are molded of rag filled Melmac by Plastic & Die Cast Products Corp., 1010 East 62nd St., Los Angeles, Calif.—a ladle and a pump dispensing jar. Both posed several difficult conflicting die design problems. Shapes and dimensions of the two types of jars required deep cavity dies. To

3—An unusually deep die is required for the fountain jar which is removed by the same chrome plated force that is means of achieving exact dimensions of the jar

3 PHOTOS 1 & 2, COURTESY PLASTIC & DIE CAST PRODUCTS CORP.



**Two types of these soda fountain jars are being molded of high impact, rag filled melamine in single-cavity molds**

meet weight and dimensional specifications, jar walls had to be comparatively thin and uniform. To resist breakage and denting, the strength factor had to be high. To conform to dimensional tolerances of the pump well in the pump type jar, control had to be exact.

## **Pump well increases mold problems**

Most difficult of the two jars to mold is the one for syrups which are dispensed by plunger-type pumps. This jar has a pump well in the bottom,  $2\frac{3}{4}$  in. in diameter and 2 in. deep, in which the pump plunger must fit to a tolerance of 0.004 in. and exert a pressure peak of only a fraction of a pound against the side walls and bottom. At the same time the jar and well must possess a shock resistance sufficient to withstand possible dropping of the jar while full of syrup.

Obtaining such precision and strength was not too difficult, according to Roy Peat, owner and president of the molding concern, but achieving instantaneous, damage-free ejection of the jar from the mold was a problem over which his die designers sweated many hours. Ejection from a  $4\frac{1}{2}$  by  $5\frac{1}{2}$ -in. die with a flow height of  $11\frac{1}{2}$  in. could have been by mechanical means, but at the risk of distortion or breakage. The company decided that it would not be necessary to use undercuts on the force plugs in order to be sure that the molded part would stick on the force plugs as the mold was opened. The natural suction created by such a deep molded part was sufficient to make this action possible. To facilitate this ejection a 0.007-in. deep groove that forms an undercut rib in the interior of the well wall was ground into the pump well portion of the cavity,  $1\frac{1}{2}$  in. from the bottom. This rib holds the newly formed jar until the well section of the force lifts past the vertical sidewall section of the well. Suction created by the retreating force is sufficient to contract the well wall enough that the groove no longer grips and the jar lifts about 1 in., permitting manual completion of the removal.

## **Molding and curing**

Both male and female sections of the die are steam heated to  $320^{\circ}$  F. A  $31\frac{1}{2}$ -oz. material charge, which allows for approximately  $\frac{1}{8}$  oz. of flash, is used. It was found that when material was poured into the mold

loose, two strokes were required to pack the charge. A loading chute (made from two rejected jars with their bottoms sawed off) which permits hand packing of the charge before it is pushed by hand from the chute into the cavity now saves the time of one press stroke.

The die is mounted in a 700-ton H.P.M. hydraulic press having 63½ in. of daylight area; a 24-in. stroke. Only about 300 tons of the press capacity is used. The

jars are cured in a relatively short time—6½ minutes.

To hold the critical diameter of the pump well, the molded melamine pump jars are inverted and placed on two cooling fixtures mounted on the bed of the press—left and right of the mold—where they remain for two complete cycles, or approximately 20 minutes.

Flash clean off, on a belt sander, is the only finishing; this requires an average of only 15 sec. per jar.

## Many German patents remain locked up

THE EDITOR'S attention has been called to a "queer" situation in the availability of a good number of alien patents pertaining to the chemical industry which it was presumed had been vested by the United States Government and would be made available to its citizens. Complainants have reported that they frequently run up against a stone wall in attempting to obtain permission to use these patents when they find that the patent desired is controlled by a former American subsidiary of I. G. Farbenindustrie. When the United States and Germany declared war, the U. S. Alien Property Custodian vested 97 percent of the stock of this American subsidiary of I. G. Farbenindustrie but did not vest in himself any of the patents of the firm. Investigators now report that some of the I. G. Farben processes which they could and would adopt if made available to them had been placed under the control of this I. G. Farben's American subsidiary before the United States entered the war and are still held by that organization.

This damper on the use of many I. G. Farben chemical processes by American chemical companies is surprising in view of the United States Government's encouragement of private business research teams which were sent into Germany at the conclusion of the war for the purpose of discovering and reporting back on the patent and secret process developments which might be unknown or in advance of those in use in this country. The only obligation placed on the various research teams was that they must make a complete report on their findings which would become public property. Much of this information, including a considerable amount pertaining to plastics, has been broadcast to the public through the office of Technical Services of the U. S. Dept. of Commerce. A 500-page book entitled "German plastics practice" by DeBell, Goggin and Gloor has been published which gives in detail many of these German processes. In addition MODERN PLASTICS Magazine has been carrying monthly articles by Dr. Gordon M. Kline on the processes since 1945.

The joker, according to affected parties, is that when American chemists or industrialists attempt to use some of these processes or manufacture the chemical products, a United States patent, owned or controlled by a

former German subsidiary, will often be found which prevents utilization of these processes and products in the United States, specially if former German subsidiary has not been 100 percent vested by United States.

The problem confronting researchers and patent attorneys in this situation is: "What is the Government going to do about it? Is it going to operate the company as a government enterprise? Is it going to sell the majority stock, formerly owned by German interests with or without the patents of the company to another firm or to a group of politico-financiers? Is the Government ever going to vest the patents of I. G. origin controlled by this company or find a way to make them available to American citizens? Is it wise for Company A to attempt to buy a license to operate under a patent controlled by the former German owned company or pass up benefits of many important I. G. Farben chemical developments until the Government decides what to do with these former I. G. patents?"

In June 1946 the retiring Alien Property Custodian testified on this matter before the House Committee on Patents as follows:

"I thought that the Committee might be interested in the most important patents that we have, and those are the patents that are owned by companies, in which the Custodian is the majority stockholder, and specifically, I would like to talk about those held by General Aniline and Film Corp., stock of which is 97 percent owned by the Government."

There is a feeling or at least a policy has been under consideration for some time, which has met with considerable favor, whereby those patents which are owned by the General Aniline and Film Corporation, for example, should be placed in the same category as what we describe as our 'loose' patents, that some technique should be developed whereby those patents should be taken out of the company and treated as if the Government was 100 percent owner. The views of the various Departments have been expressed and it is expected legislation will be proposed authorizing the Custodian to accomplish that result. We have all presented our views, and I think the Administration's position will be stated to the Committee of Congress for such disposition as Congress may determine."

Various rumors and press articles intimate that government authorities have made attempts to formulate legislation but there is no evidence that anything has been accomplished. What has happened?



*Electronic circuits and assemblies embedded in this casting resin have the advantage of being well protected against rough handling and adverse atmospheric conditions while receiving good electrical insulation*



PHOTOS, COURTESY NATIONAL BUREAU OF STANDARDS

# Cast resin for high-impedance circuits

by P. J. FRANKLIN and M. WEINBERG\*

**M**ANY NEW electronic applications are made possible by a new casting resin developed by the National Bureau of Standards. An outgrowth of war-time research on such devices as the radio proximity fuze, NBS Casting Resin<sup>1</sup> combines the low power factor (essential to high-impedance, high-frequency circuits) with such other necessary properties as low dielectric constant, short polymerization period at low temperature and atmospheric pressure, high impact strength, small volume shrinkage on polymerization, dimensional and electrical stability and low moisture absorption. The resin is of low viscosity and low surface tension, and hence may be poured through small openings. It hardens to a rigid solid around circuit elements without adverse effect on circuit operation.

Only non-polar substances have a dielectric loss low

enough to be considered applicable to high frequency work. These substances, limited in number, have characteristics which restrict their use as casting resins. Styrene polymerizes in a few days and 2,5-dichlorostyrene in much less time, but the shrinkage on polymerization for both compounds is too great. By copolymerizing and by adding polymers as fillers to monomers, however, a number of suitable casting resins were produced. At present the best compound attained (NBS Casting Resin) is produced by this formula:

Compounds	Amount by weight—%
2,5-dichlorostyrene	33.0
Poly 2,5-dichlorostyrene	21.5
Styrene monomer	21.0
Polystyrene	11.0
Hydrogenated terphenyl	13.0
Solution containing 60% divinylbenzene	0.5

The rate of polymerization of styrene is accelerated by the addition of dichlorostyrene and a solution con-

\* National Bureau of Standards, Washington, D. C.

<sup>1</sup> This development was centered in the Ordnance Development Div. of the National Bureau of Standards. The assistance of other members of the division, particularly Miss Emma Lee Hebb (preparation of samples) and Leonard C. Pochop (electrical measurements), is acknowledged.

taining 60 percent mixed isomers of divinylbenzene. The dichlorostyrene serves also to reduce flammability, as well as to permit the use of divinylbenzene as a cross-linking agent. This completely removes the "cauliflower" effect produced when divinylbenzene is polymerized with styrene at a low temperature. The polymers of styrene and 2,5-dichlorostyrene act as fillers to cut down overall shrinkage due to polymerization.

By producing cross-linkage in the final product, the divinylbenzene imparts to the polymer certain thermosetting characteristics which slightly increase the heat distortion point. Preliminary tests of mixed isomers of dichlorostyrene indicate that they may be substituted for dichlorostyrene with only minor losses in dielectric characteristics and compatibility.

### Preparation

Preparation of the casting resin is relatively simple. Immediately after putting the components in a suitable mixing vessel the mixture is placed on a roll mill to prevent clumping and is rolled until a viscous dispersion is formed. Following about 16 hr. of continuous rolling, the casting resin is ready for use, requiring only the proper quantity of catalyst to initiate polymerization. Special treatment must be given the 2,5-dichlorostyrene and styrene to remove excessive amounts of inhibitor which interfere with polymerization and electrical properties. The monomer may be treated with a 10 percent sodium hydroxide solution followed by washing.

### Polymerization technique

Electrical properties of the casting resin are affected only to a minor extent by the method of polymerization. Therefore the length of time for polymerization of the resin should be the minimum required for the chain length of the polymer to build up to a point beyond which there is no improvement in mechanical properties and all monomers are eliminated. The minimum time varies with the catalyst, the percentage of catalyst used, the temperatures for polymerization and size of casting.

Since the polymerization reaction is exothermic and the resultant heat catalyzes the reaction, it is advisable to initiate polymerization at a low temperature and with a minimum amount of catalyst. Otherwise the reaction may become auto-catalytic with an increasing polymerization rate causing the final product to be cloudy, contain small bubbles, be deficient in mechanical strength and give a burned appearance. For very large castings, a small amount of catalyst is used and the casting is permitted to gel at room temperature. As air has a slight inhibitory effect on the polymerization, the surface may be either covered with cellophane or flooded with glycerol after gelation if a hard surface is desired.

The Bureau found that benzoyl peroxide produced the best cured polymer. To improve the dissolving properties of the benzoyl peroxide and to eliminate the filler, the material was dissolved in acetone and then precipitated by water, filtered and dried. This produces extremely fine particles which quickly dissolve in the casting resin. Catalysts such as lauroyl peroxide,

butyl hydroperoxide, caproyl peroxide, and caprylyl peroxide may be substituted for benzoyl peroxide.

The following are some of the measured mechanical and electrical properties of the NBS Casting Resin, cured at 50° C. employing 0.1 percent benzoyl peroxide as the catalyst:

Compressive strength, p.s.i.	17,100
Izod impact, ft.-lb./in. of notch	0.228
Coefficient of thermal expansion per ° C.	$11 \times 10^{-5}$ (approx.)
Water absorption (24 hr. immersion), %	0.01
Volumetric shrinkage on polymerization, %	8.0
Density of monomer	1.13
Heat distortion, ° C.	68-70
Power factor (at 100 megacycles and 50% RH)	0.0004-0.0008
Dielectric constant (at 100 megacycles and 50% RH)	2.5
Dielectric strength ( $1/16$ in. sample; volts/mil)	610-660
Volumetric resistivity (megohm-cm.)	$> 10^{17}$

The liquid resin may be stored at 0° C. for a few months without a catalyst, and for a few weeks with a catalyst, before the viscosity increases to a point where pouring is difficult. At room temperature, the catalyzed casting resin gradually increases in viscosity and must be used in a day or two. The cured polymer may be drilled or turned on a lathe.

### Applications and significance

When employing the NBS Casting Resin in devices using glass vacuum tubes, proper protection for the tubes, such as rubber jackets, should be provided to prevent possible cracking by thermal and mechanical shock. All sharp corners should be eliminated from any object which is to be cast, as strains set up at these points may cause crazing. To reduce strains, and obtain maximum hardness and total polymerization, it is advisable to cure for a few days after the initial cycle.

When objects are to be suspended within the center of the casting resin, it is advisable first to gel a portion of the casting resin and then to allow the gelled resin to support the sample. The mold is then filled completely with the casting resin and cured, after which the line of demarcation is invisible. Glass and metal molds lubricated with silicone grease have been used successfully.

By rigidly embedding electronic circuits or even complete plug-in sub-assemblies, NBS compound provides excellent electrical insulation as well as protection against rough handling and deteriorating atmospheric conditions. It is particularly well adapted for use with subminiature electronic equipment built by the new printing techniques. Several practical applications of resin-potted circuits at the Bureau have given operation comparable to that of conventionally constructed devices. The resin should be especially useful in high-impedance control devices in heavy industry to provide adequate protection against such conditions as vibration, acid fumes, high humidity and salt spray. Such conditions are encountered in steel mills, plating plants and similar industries. Other potential uses include the potting of components and subassemblies for radar, and numerous subminiature electronic devices.

**I**MPERVIOUSNESS to temperature changes and moisture plus constant balance were qualities in golf clubs sought by Merilite Products Co., 942 S. Water St., Milwaukee 4, Wis. After exhaustive tests by top golfers on some 1500 heads, the result was a Greenmaster putter and four matched "woods" made of Merilite, a new tough resilient plastic material. Clubs were designed by Francis Gallett.

The putter has a black or cherry colored streamlined head with no exposed weights or screws. A scientifically balanced counterweight is imbedded in the head which in turn is electronically bonded to a steel shaft. This inner construction is evident in the picture of the transparent model of this head. The four woods—driver, brassie, No. 4 wood and spoon—come with ebony heads and cherry inserts or vice versa. The insert is chemically bonded to the rest of the head. The absence of screws assures a true hitting surface.

Swinging weight can be adjusted to suit the individual golfer by means of removable metal disks. The lightweight aluminum sole plate is held by screws, and weight adjustments can be made in about 30 seconds. Water absorption of heads is  $\frac{1}{10}$  of 1 percent.



PHOTO, COURTESY MERILITE PRODUCTS CO.

## MOLDED GOLF CLUB HEADS

**U**TILL another set of golf clubs, utilizing plastics in the golf heads and selling under the name Springfield, has recently been placed on the market. The heads which are molded of Celcon, were developed by engineers of Celanese Plastics Corp. working with the molder, Pro-phy-lac-tic Brush Co. of Florence, Mass., and the manufacturer, Sporting Goods, Inc., of Springfield, Mass.

The ethyl cellulose heads are said to retain the best features of the finest persimmon woods, including the sharp "kick" demanded by inveterate golfers, and are, in addition, virtually indestructible. The clubs survived 6600 test shots in an automatic driving machine duplicating the conditions of actual play, with no evidence of cracking either in the neck or the club head itself.

The clubs are supplied in sets available as registered, matched and open stock. Women's sets, in tan with harmonizing grip and trim, are also included in present production plans.

PHOTO, COURTESY CELANESE PLASTICS CORP.



# Improved record needles

1

**I**NTERESTING not only from the standpoint of end-use performance but also that of production is the unique phonograph needle with a nylon "knee," recently placed on the market by Webster-Chicago Corp. and Decca Records, Inc.

Developed by William H. Hutter, Hutter Development Co., Wheaton, Ill., the needle takes advantage of the pronounced internal resistance or self-damping characteristic of nylon to minimize mechanical resonance distortion such as needle scratch and surface noises and to obtain improved tracking at high and low frequencies at reduced needle pressure. Extensive research investigation preceded the perfection of the injection molded nylon "knee action" component, which serves as the connecting link between the aluminum shank and the jewel or alloy tip.

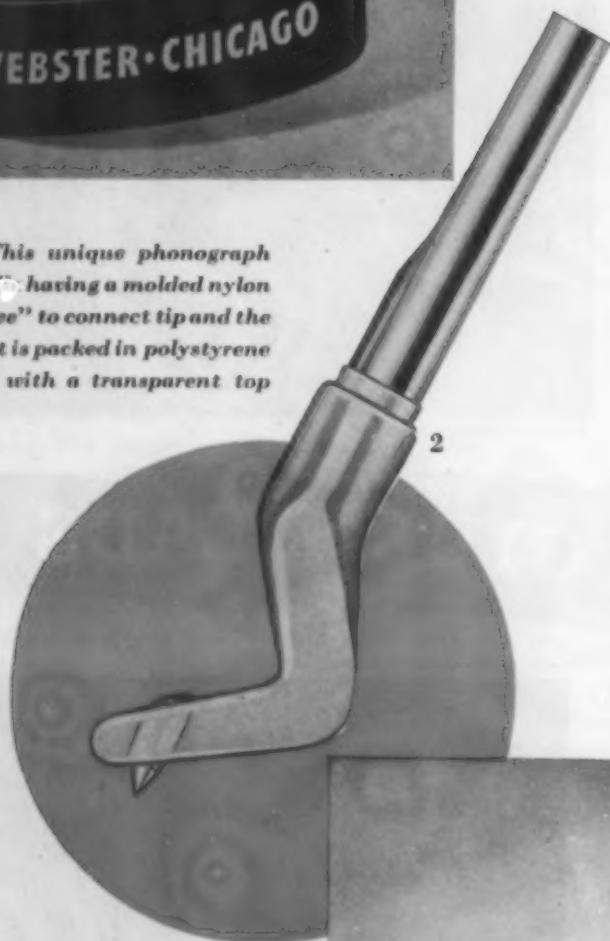
## Eleven reasons for use of nylon

The nylon knee absorbs vertical shocks caused by the pinch effect of record grooves and also levels out horizontal shocks of needle bounce. As a result, a gentle, floating needle ride is created, producing improved reproduction quality, prolonging record life and also extending the useful function of the hand-polished sapphire jewel tip. The needle is said to be good for as many as 15,000 plays.

From the tone fidelity standpoint, the natural resonance or frequency of practically all metals suitable for phonograph needles is highly undesirable since it introduces distortion in the music in the form of amplitude

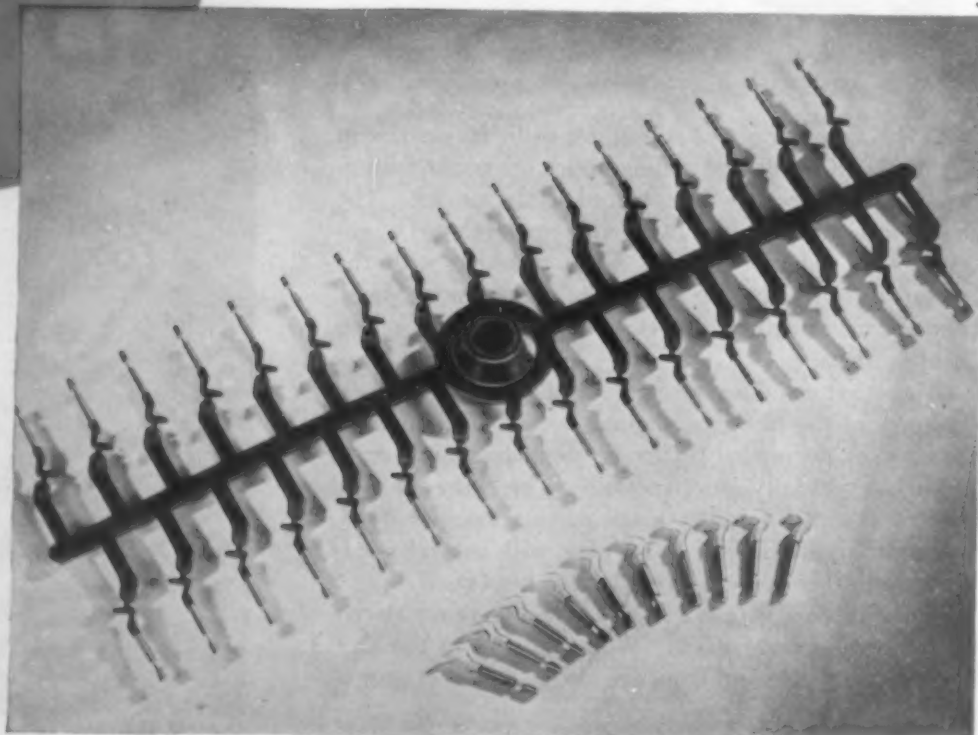
3

1—This unique phonograph needle having a molded nylon "knee" to connect tip and the shaft is packed in polystyrene case with a transparent top



2—Nylon in the needle knee minimizes resonance distortion, gives it non-magnetic properties, assures mechanical strength and toughness

3 (Right)—A 32-cavity die, with graded sprues, is used in molding nylon knee action insert shank for the phonograph needle. Shanks in foreground have not been drilled for insertion of the needle



# molded of nylon

at the natural resonance of the needle. The ideal material for this purpose is one with very high internal resistance, which will produce a high damping effect on the spurious unwanted vibrations. At the same time, however, the material must have spring action.

Following are some of the other properties sought by Mr. Hutter in the development of this needle:

1. Very light weight, minimizing inertia of the moving parts.
2. Resistance to fatigue and crystallization under service conditions.
3. Great mechanical strength and toughness.
4. Excellent elastic memory and recovery.
5. Good negative cold flow characteristics.
6. The ability to be injection molded (in the interest of high production), uniformity and stability.
7. Very high melting temperature.
8. Chemical stability and resistance to moisture.
9. Non-magnetic and non-electrostatic properties.

Investigation disclosed nylon to be the ideal answer to this rigorous set of specifications. However, there were still production problems which had to be solved.

## Thirty-two pieces at one shot

Because of the tendency of this material to melt abruptly within a few degrees of its top temperature and to flow like water into the smallest of spaces, unusually high accuracy was necessary in the mold. In addition, the molding required an especially critical degree of temperature control and close supervision of the press cycle. Designing and building of the set of dies for this job were handled by Harold Cloyd and Bruno Roehrl of National Organ Supply Co. of Erie, Pa., the company that does the molding.

The mold for the knee action insert shank needle is a 32-cavity die with graded sprues (Fig. 3). The shank around the base of which the nylon part is molded is of aluminum alloy; produced from centerless ground rod stock. The die is semi-automatic with relation to the manner in which it holds and releases the aluminum inserts.

That part of the insert (about  $\frac{1}{8}$  in.) which is held in the nylon knee is knurled to prevent its twisting or pulling loose. In view of the high gripping strength of the molded nylon, however, a very firm bond could have been obtained even without the knurling.

## Finishing and packaging

Following the molding operation, an oblique hole is drilled in the tip of the nylon knee and the sapphire, diamond, ruby or alloy tip which actually contacts the record is inserted, being secured in position with a Durez phenolic resin. The needles in the foreground of Fig. 3 have not yet been drilled; the needle shown in Fig. 2 is complete and ready for packing.



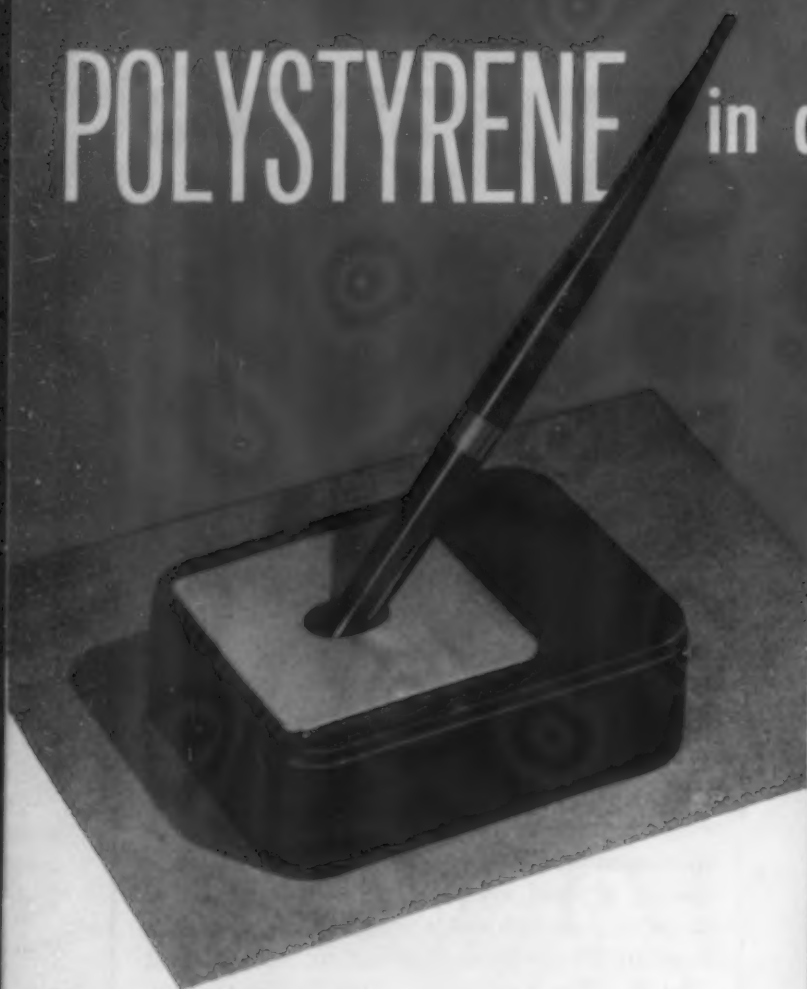
HOT MEALS OR COLD DRINKS CAN BE easily and safely transported by picnickers or sportsmen to the camping grounds without change of food temperatures when carried in standard pails inclosed in a Pailmaster, manufactured by Plastic Sheet Fabrication, Inc., 28 East 73rd St., New York City. This Pailmaster consists of a Vinylite container, lined with a 1-in. thick Fiberglas filler, which fits around a 10-qt. Wheeling bucket to give the necessary insulation to retain for many hours the temperature of the foods at the time they were inserted in the pail.

The Pailmaster has a removable top, made of the same plastic materials as the container, which is held firmly in place when the container draw strings are tied. For sturdy construction, and to protect the plastic filler from damage, the vinyl container is electronically sealed at the seams. Nickel-plated grommets are inserted in a reinforced vinyl strip.

In a test by the manufacturer to gage the efficiency of the pail's insulation, 150 ice cubes were inclosed in the bucket for 15 hr. while it stood in a room of 70° F. temperature. At the conclusion of the test, the cubes were found to be large enough to prepare cold drinks.

Plastic Sheet Fabrication, Inc., also makes a similar container that is designed to fit inside of a pail rather than outside. It has the same insulation properties as the outer container but is recommended to those who plan to give the Pailmaster hard use—in which case the metal pail receives most of the rough handling. If the inner container and the outer container are both used, a maximum amount of insulation is achieved.

# POLYSTYRENE in a non-spill desk set



1



2

A DESK set that can be tipped over—or even carried upside down—without spilling has recently been introduced to the market by the W. A. Sheaffer Pen Co. in an all-polystyrene housing. The unusual non-spill feature, combined with modern design, distinguishes the new Safeguard reservoir desk set shown in Fig. 1. The plastic base is molded by the Thermoplastics Div. of Chicago Molded Products Corp., 1025 N. Kolmar Ave., Chicago 51, Ill.

According to the molder, polystyrene was selected for this application because its gleaming finish harmonizes readily with any decorative scheme and because of its high moisture resistance and dimensional stability which makes for accuracy and ease of assembly.

Ability of the new set to resist spilling results from the construction of the base, which is divided into two main compartments, the larger holding the reserve supply of ink. The other, known as the expansion chamber, is the section into which the pen socket projects. It corrects for temperature and pressure, constantly regulating the amount of ink which contacts the pen point.

When the base is turned on its side, as shown in Fig. 2, the ink remains safely within the compartments and connecting channel instead of spilling out with the cus-

tomary disastrous results. A sample set which is made entirely of transparent polystyrene and which is pictured in Fig. 3 shows the parts more clearly than the regular set made in colors.

The four polystyrene components of this set are: 1) the bottom (just described) which includes the channel through which ink flows from reservoir to the pen point expansion chamber, 2) the top, which includes the four sides, pen socket and passage through which the base is filled, 3) the filler tube and 4) the filler plug.

Molding of these parts presented a number of problems. The top, for example, contains a deep side core through which the ink is filled. Diameter of this opening steps down progressively, and a portion of it is internally threaded to receive the threads of the filler plug. The top also has a tapered opening into which the pen is inserted. This core has 12 longitudinal ribs which keep the gripping position of the pen clean.

#### Plug designed with slot and ridge

The clear bottom piece on base includes the ink channel, whose open side is sealed over in the final assembly, and the bowl-shaped bottom of the dip socket, fed from the ink channel through a passage about  $\frac{1}{16}$  in. in diameter and  $\frac{1}{4}$  in. long. The filler tube has a prong



3—A transparent polystyrene model of the desk set shows the four parts of which it is composed—base containing ink channel, top with pen socket, filler tube, filler plug

which facilitates spillproof filling of the base, while the filler plug has an extra collar which forestalls leakage. Another interesting feature of the filler plug is the head, designed with a slot and ridge at right angles so that either the finger tips or a coin may be used to screw it in.

These molded parts are supplied directly to the manufacturer at Fort Madison, Iowa, where all assembling takes place.

To fill the set, the user stands the base on end and removes the filler plug. He next removes the outer cap from the special Safeguard bottle of Skrip supplied with each set. The remaining inner seal on this bottle is then punctured by inserting the neck of the bottle through the filler opening, causing the seal to contact the inner prong of the filler tube. When punctured, the entire Skrip supply is released into the base, whose capacity matches that of the bottle.

The Safeguard sets are currently being made in four models, ranging from the moderately priced "fineline" style to the deluxe model whose pen is equipped with the Sheaffer Lifetime point. The two more expensive models have handsome gold trim on the top of the base as well as on the pen itself. Incidentally, to lessen the possibility of tipping, two felt-covered lead weights are anchored to the bottom by six integrally molded lugs.

Pen holders for all except the highest priced of the four models are injection molded of Tenite II by Injection Molding Co., 3827 Independence Ave., Kansas City 1, Mo. The cellulose acetate quill for the remaining set is molded by Sheaffer.

ALTHOUGH MANY ATTEMPTS HAVE been made to use plastics in bookcases and stands, many of the applications have not been too successful. The principal difficulty has been the finding of a sufficiently strong material that could be satisfactorily molded without excessive cost. William H. Wise & Co., Inc., 50 W. 47th St., New York City, has solved this problem by using a Textolite compound, with a woodflour filler, in a bookshelf made to hold their five-volume set of books that picture the history of the Second World War.

The Plastics Div. of General Electric Co., Meriden, Conn., compression molds the stand in one piece—a rather complex undertaking considering that the stand has four dividers for books, plus curved end sections and straight frontal and back strips. End sections are hollow—a factor which helps keep the case at a 22 oz. total weight. Medallions depicting the activities of the war contribute to the attractiveness of the stand as a table piece, as does the mahogany color which harmonizes with the books and with the library furnishings.

Molding is done in a 1-cavity die and a relatively short cycle is required. After the stand is taken from the press, small rubber feet are hand

inserted into each of the four holes molded in the base. These holes are slightly tapered and have four vertical ribs which grip the rubber feet.

Due to the exceptionally high mold finish, no buffing or further finishing is required after a hand filing operation removes flash.



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# Plastics Engineering

F. B. STANLEY, Engineering Editor

## Molded vinyl phonograph records

**M**OLDED vinyl phonograph records have many advantages over the old standby shellac disks. Among them are lessened needle noise, resistance to breakage and longer life. With these vinyl records it is practically impossible to detect any signs of needle noise which has been, and still is, one of the most objectionable features of the shellac record. And we all know the fate of the shellac record that is dropped on the floor. The vinyl record, in contrast, is practically impervious to cracking, breaking or chipping. The playing life, of the vinyl record, when the modern standard lightweight head is used, is as great or greater than that of the shellac. And with all this, the vinyl product gives infinitely better quality reproduction than has ever been obtained from a shellac recording.

With all these features and advantages it is not surprising that vinyl materials should find a very large market in the record industry. What is surprising is that use in phonograph records of polyvinyl chloride, which made its advent in 1930, was in the nature of a

discovery rather than a development consciously striven for by the manufacturers.

### Early test work<sup>1</sup>

In 1930 Carbide & Carbon Chemicals Corp. was producing small lots of vinyl chloride vinyl acetate copolymer resin in an experimental autoclave at Charleston, W. Va. Various samples of this resin were sent to the Mellon Institute where experiments were carried on with a view to determining possible applications for a copolymer resin of some chloride content and some molecular weight. Samples of the vinyl resin selected as being adapted for a specific application as a result of these tests were then sent back for evaluation to Charleston, the personnel there being advised as to what, in the opinion of the Mellon Institute, would be a proper grade of resin to make for the succeeding experimental runs.

In the process of this evaluation at the Mellon Institute an extraction was made on some very brittle vinyl

<sup>1</sup> The facts regarding this early development work were supplied by George C. Miller of the Bakelite Corp.

\* Reg. U. S. Patent office.

PHOTOS THROUGH 9, COURTESY S&W-WAY INDUSTRIES, INC.

1—Slightly different from the usual vinyl phonograph record are these combination vinyl, aluminum and paper disks. The aluminum comprises the center core and is faced on both sides with the printed paper over which is molded the vinyl material





2 (Above)—First step in producing records mold is cutting of sound track on acetate master with precision lathe



3 (Above)—Before aluminum-vinyl record mold is loaded, vinyl biscuits are preheated between electric hot plates

4 (Below)—This tilting head press for vinyl record molding is completely automatic. Note external hydraulic cylinders for operating and locking tilting head of press



chloride vinyl acetate copolymer and the residue used to mold some plaques. These molded parts appeared to be quite tough, yet fairly easily molded—characteristics that led to the discovery that vinyl resins might be suitable for record production. A record was molded of the copolymer residue by placing a heated preform between record matrices and pressing the assembly in flat platen laboratory press. Played at the Mellon Institute the record seemed quite good.

A meeting was then arranged with the Radio Corp. of America, Camden, N. J., at which this original vinyl record was played, as well as additional disks molded by RCA on its regular shellac record production molds. The cautious report emanating from this meeting stated, "that the records seem to have a somewhat lower noise level than shellac and seemed to be quite tough and difficult to break." It is interesting to note at this point that these particular records were molded from a vinyl resin which had been heavily filled with inert material. Most record production today makes use of the pure resin alone, with no filler. Years of testing and recent development work at the Bound Brook, N. J., plant of Bakelite Corp. (discussed toward the end of this article) have shown that the addition of any filler, even the smallest percentage, to the material will tend to increase the noise level of the record. In some records, particularly of the laterally recorded variety, filler of a selected type is sometimes desirable for reasons of greater wear.

Further test work followed this meeting with RCA—additional experimental lots of a resin corresponding in molecular weight and vinyl chloride content to the residue from the first extraction being used for the tests. Finally, in 1931, what might be called commercial shipment (greater than 5000 lb.) began to go forward to RCA. These shipments constituted the first commercial use of Vinylite brand resin for record materials. These records, incidentally, were produced for electrical transcription and were used mainly by broadcasting stations. It was not until the fall of 1945 that RCA introduced its Red Seal record, manufactured entirely of Vinylite brand resin, which has found so wide a market. It is interesting to note that the first extraction by the Mellon Institute produced a material which was roughly equivalent to that known today as VYHH resin which is the standard formulation for records.

#### Aluminum vinyl records

Many companies are now producing vinyl records and they have all been very successful. However one company, Sav-Way Industries, Inc., 4875 E. Eight Mile Rd., Detroit, Mich., decided to design vinyl records which were different from all of their competitors, to produce a record which could be sold at a somewhat lower price. A prerequisite for such a price cut was a reduction in the amount of vinyl material in each record. To accomplish this the company incorporated an aluminum disk in its design. This disk is used as a core around which is molded a shell of Vinylite brand resin. For a 10-in. record, the aluminum disk is die

cut to a diameter of  $9\frac{1}{2}$  in., leaving a  $\frac{1}{4}$ -in. rim of solid vinyl all around the perimeter of the record.

Paper disks, die cut to the same diameter as the aluminum reinforcing disks, are used to hide the aluminum, one paper disk being placed on each side of the metal. Before being molded into the record each paper disk is first printed with a four-color design appropriate to the theme of the music. This gives the paper a secondary function—that of merchandising—since the transparent vinyl in no way obscures the paper disk.

In production, the aluminum disks are blanked out of a  $9\frac{3}{4}$ -in. continuous strip after the center hole has been punched. Before blanking the strip is run through a set of flattening rollers which ensure that the disks will have no curvatures. At the moment Sav-Way Industries is using a Henry Wright automatic stamping press which produces 52 disks per minute. There follows a number of operations, including de-greasing of the aluminum disk, its coating with an adhesive solution and drying of the adhesive to prepare the metal for molding. All operations are handled by one conveyor system at the rate of 1400 disks per hour.

In line with its desire to bring down the manufacturing cost of these records as much as possible, this record producing company decided to produce its own preforms, a Banbury being set up for mixing and compounding the vinyls. After compounding, the vinyl material is sheeted in a set of rolls, then die cut to preform size. These preforms are carefully inspected for dirt or any slight speck of tramp metal. There are several methods of handling this inspection; one of the latest and best is a metal detector. This unit is an electronic device produced by RCA and can be so set up that it will automatically reject any preform showing signs of tramp metal.<sup>2</sup> Dirt or other non-magnetic impurities can be detected by the simple method of passing the preform over a source of strong light.

#### **Making the record mold**

After this preliminary work on the three components of the records the aluminum and paper disks and the vinyl preforms are taken to the molding or pressing room. However, to produce a record, record molds or stampers must be available. Here again plastics play their part but in this case it is cellulose acetate.

The operations for producing a metal stamper or mold appear quite involved but each of the approximately 73 different operations between the original recording and production of the finished metal stamper are of the greatest importance. The basic steps are:

When a recording is to be made, a 16-in. disk of cellulose acetate is rotated at  $33\frac{1}{3}$  r.p.m. and a sound track made on the disk. This large disk is then played back and a new recording made on a 12-in. cellulose acetate master. Surface of this master, upon which the sound track has been cut, is then silvered in order to make it conductive. Some companies use a sputtering machine for this process. This machine is

<sup>2</sup> "Metal detection for better plastic products," by Paul A. Greenmeyer, MODERN PLASTICS 24, 137 (April 1947).



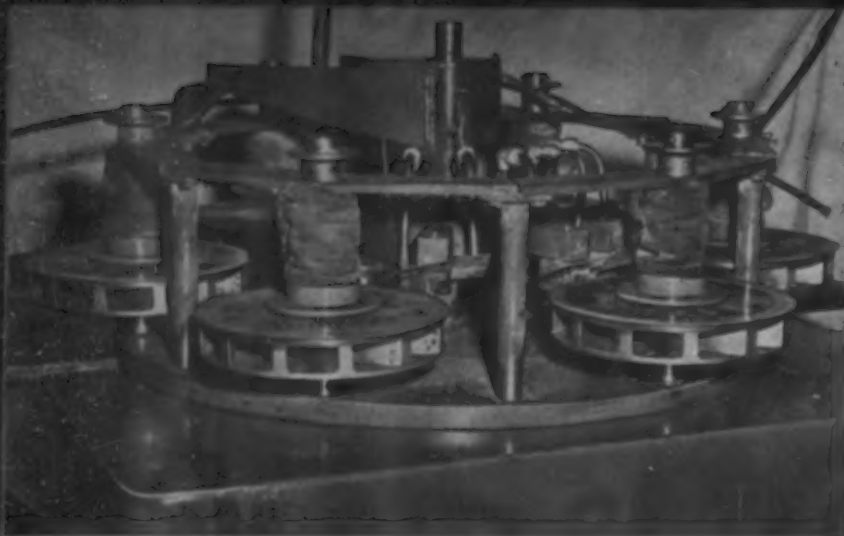
5 (Above)—After mold is loaded with aluminum disk, two paper disks and two vinyl preforms, a completely automatic cycle is started by pressing button on control panel



6 (Above)—After heating and chilling cycle is complete, head of press tilts back and operator removes the record

7 (Below)—Rough trimming of excess flash from record with a knife is performed while the next cycle proceeds





8—Final edging and polishing of parting line on vinyl-aluminum records is done on an automatic rotary machine. Records need only be placed on rotating disks, removed when finished



9—Whenever molding plant is in operation, girls are audibly spot checking quality of the aluminum-vinyl records by means of standard play-back units

so designed that a vacuum may be drawn in a chamber which contains electrodes of the metal to be deposited on the surface of the master. The master is placed in the chamber, the vacuum is drawn, and as an arc travels between the electrodes the finely divided particles of the metal are given off and settle by gravity on the surface of the part to be coated, in this case the 12-in. master. This coated master is then electroplated with copper to a thickness of about 0.040 inch.

After plating, the copper is stripped from the cellulose acetate master. This copper disk is now known as a metal master. A parting agent is applied to the surface of the copper on which the sound track is located and the copper disk is again placed in the plating tanks. What is known as a mother is then separated or stripped from the metal master and, after application of a suitable parting agent, the mother is placed in the plating tank where a stamper is plated directly on the mother. This metal stamper, after being cleaned up and turned to size, is placed in a mounting ring and goes directly to the molding press.

#### **Molding an aluminum-vinyl record**

Production of records with aluminum and paper disk cores is more involved than is the case with a solid Vinylite record. A square preform containing half the weight of the vinyl resin required for one record is placed on the lower stamper. The one of the die-cut paper disks is placed on the preform, followed by the aluminum disk, a second disk of paper and a second preform. The press is then closed, the heated stampers causing the vinyl material to flow and fill out the mold. Flash type molds are practically universal for the production of records and for this reason a rather large amount of flash is squeezed out around the stampers.

As soon as the flow of the material has been completed, the steam for heating the stampers is automatically shut off and cold water circulated through the platens of the mold. This water chills the stampers and sets the thermoplastic material, after which the mold is opened and the completed record removed.

The operator then trims away most of the flash with a knife leaving the final finishing of the edge for later.

To speed up the molding cycle, Sav-Way Industries heats all its preforms with an electric preheater (Fig. 3). The preforms, when placed in mold, are very soft and begin to flow immediately as pressure is applied.

The tilting head presses used in this plant (Figs. 4 to 7) are completely automatic in operation. Not only does the press open and close automatically but the steam and chill water is controlled in the same manner. Most presses used in the molding of phonograph records are of the tilting head type and great ingenuity was required to achieve automatic locking of the head of the press in the molding position. Hydraulic cylinders are used to tilt and lower the head and additional cylinders actuate wedge type clamps which provide the locking action. With this fully automatic equipment, records are produced on an approximate 50-sec. cycle which not only includes opening and closing the mold and loading of the preforms and inserts, but the time required for heating the mold to molding temperature, chilling it until the material sets, and re-heating it once more in preparation for the next cycle.

#### **Finishing and inspection**

The outer edge of the records must then be trimmed and smoothed. The J. M. Nash Co., 2356 N. 30th St., Milwaukee, Wis., developed an automatic rotating machine for this edging operation which consists of a rotating table on which are mounted in a circle six rotating plates. As the entire mechanism revolves it carries one revolving record after another past a series of knives and brushes which actually lathe the edge of the record to a perfectly smooth finish and then polish it to a luster. Only one operator is required for loading and unloading the records as the machine continues to revolve. Today a large 15-spindle edging machine is used in production. This unit requires two operators, one loads the records on the spindle, the second removes them after edging has been performed.

During production a very close check is kept on the

records coming from each stamper. One inspector is given complete control of a bank of presses and she spot checks the work being produced at all times. This entails collecting one record from each press at stated intervals and actually putting them through an audible inspection during which the inspector listens for excessive surface noise or other imperfections. By this system of inspection a set of stampers producing poor records can be immediately taken out of production.

#### **Experimental work on vinyl records\***

Record enthusiasts, especially those interested in classical recordings, are constantly looking for the highest possible fidelity in the reproduction of their favorite music. Recognizing the importance of improved records, and of cheaper records, Bakelite Corp. has in its Bound Brook Laboratories a section completely equipped for processing and molding operations as well as the evaluation of the finished records. This company's development program is directed not only toward the achievement of improved record compounds but to the production of a lower cost compound by inclusion of fillers or extenders without debasing quality.

One of the most important phases of the entire sound record program is the evaluation of the many compounds made up in the laboratory. The evaluation method is based on two important changes which occur during the life of the record; namely, increase in noise level and decrease in response of high frequency sound.

In the evaluation of sound record materials, a standard frequency record, covering the frequency range of 1000 to 8000 cycles per sec., is employed. On this test record, unmodulated or "silent" grooves are also impressed. Noise level of the record is measured in these silent grooves. In the first step of the testing procedure, the newly molded experimental record is played on a transcription turntable and the output fed through several amplification stages. The sound level of the tone grooves and the silent grooves are registered on a meter in terms of decibels. A decibel, abbreviated db,

\* Information in this last section was supplied by the Development Laboratories of the Bakelite Corp. in Bound Brook, N. J.

**10—This tilting head press produces test records for experimental work by material's manufacturer. Being 100 percent vinyl, these records make use of only one preform**

PHOTOS 10 AND 11, COURTESY BAKELITE CORP.



is the smallest difference in sound level that the average human ear can detect. Since db measurements give relative values it is necessary to set an arbitrary zero or reference level. The sustained 1000 cycle per sec. sound was chosen to standardize the equipment at the zero level. This reading will vary according to the instrumentation used but it has no effect on final results which are difference values. Using this reference noise level of unplayed test record, based on Vinylite VYHH resin, was found to be about minus 38 decibels.

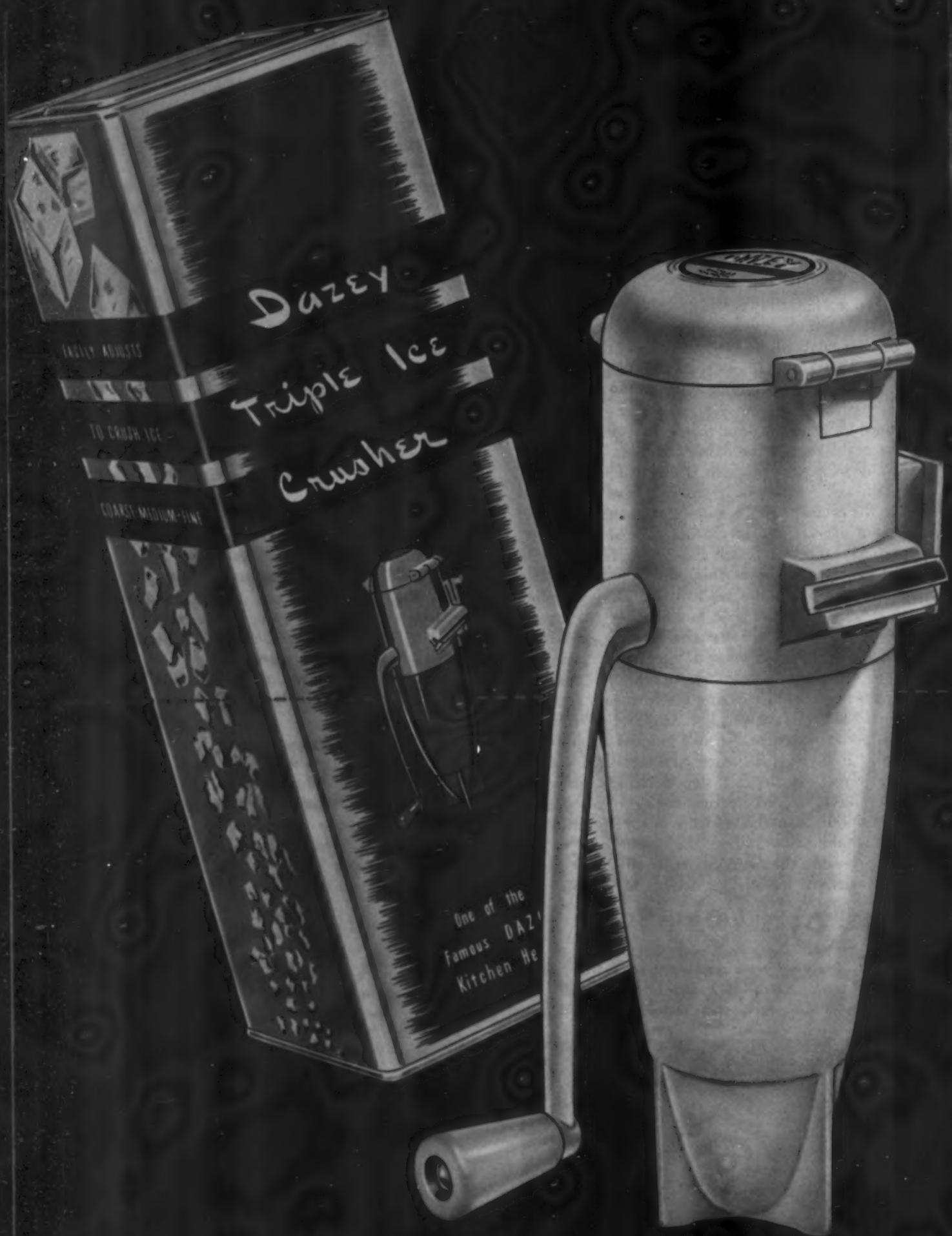
Throughout the wear test, the record is played continually on an automatic changer equipped with an electrically operated counter. A standard steel needle, replaced at intervals of 25 playbacks is used in the reproducer head of this unit. At the end of each cycle of 25 playbacks, the test record is replayed on the transcription equipment where noise level and frequency response are measured. This procedure is repeated until the record is considered to be worn out. Bakelite Corp.'s laboratory has arbitrarily set a level of minus 24 decibels as the point for stopping the test. At this point the noise level has increased 14 db.

There are several factors which affect the rate of increase in noise level. Specifically they are: composition of molding material, processing conditions, quality of molding, design and type of playback needle and needle load. It is an accepted fact that a heavy pickup will cause greater wear during a given number of playbacks than a lighter pickup. In view of this, investigations were made using three pickup weights with a considerable variation in rate of noise level increase. With a 1.25-oz. pickup load, for example, 700 playbacks were required before the noise level for a record of unfilled Vinylite brand resin rose to the minus 24 decibel limit.

It is interesting to note that although these records were considered worn out their noise level at this stage was equal to the noise recorded for a new commercial shellac composition record. However, at this point it increases quite rapidly. The very latest results in this evaluation work indicate that improved compositions will be developed in the near future.

**11—Equipment such as this play-back unit and amplifier is used in experimental work to record surface noise increase, high frequency response decrease for test records**





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*It's Plaskon Molded Color!*

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Plaskon molding materials have distinctive features that give them widespread application in the household appliance, electrical, cosmetic, drug, garment and many other fields. We shall be glad to help you adapt the many advantages of these versatile materials to your manufacturing and merchandising needs. Write for free illustrated book showing many applications of Plaskon\* products.

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# Ridge forming acrylic sheet

by W. W. FARR and R. TOMLINSON\*



ALL PHOTOS, COURTESY ROHM & HAAS CO.

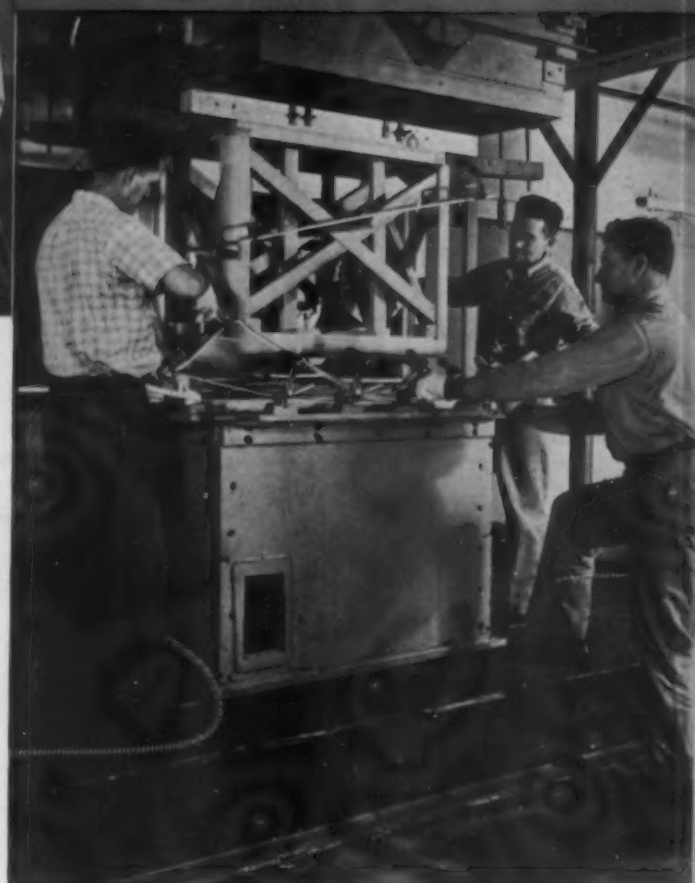
*The first step in ridge forming is the heating of acrylic sheet. Here workmen, who are wearing gloves to prevent marking the piece, remove hot sheet from the oven*

**T**WO SERIOUS problems in the forming of acrylic—mark-off and high cost of molds—have been overcome to a great extent by a recently developed method of forming sheet plastics called ridge forming.<sup>1</sup> This new technique, suitable for production manufacture of such items as housings, shields, cases or covers for electrical equipment, features a skeleton mold that makes contact with the plastic only at major shape-determining points.

It is recognized that the ideal way of forming a curved part from a sheet of acrylic or other plastic is to clamp the heat-softened sheet across an opening having the contour required in the base of the finished part, the desired depth being obtained by use of vacuum drawing or air pressure. Free-blown parts of this type have the fine optical properties of the original flat sheet since the shaped portion of the plastic is in contact with nothing but air during the forming operation. This method is used in making one-piece inclosures for airplanes.

## Mold contact mars acrylic

However, free blowing has its limitations. The shape produced tends toward the spherical and only a limited control of contour is possible. The desire for more variety in shapes led naturally to the use of molds, but the surface of heat-softened acrylic ready for form-



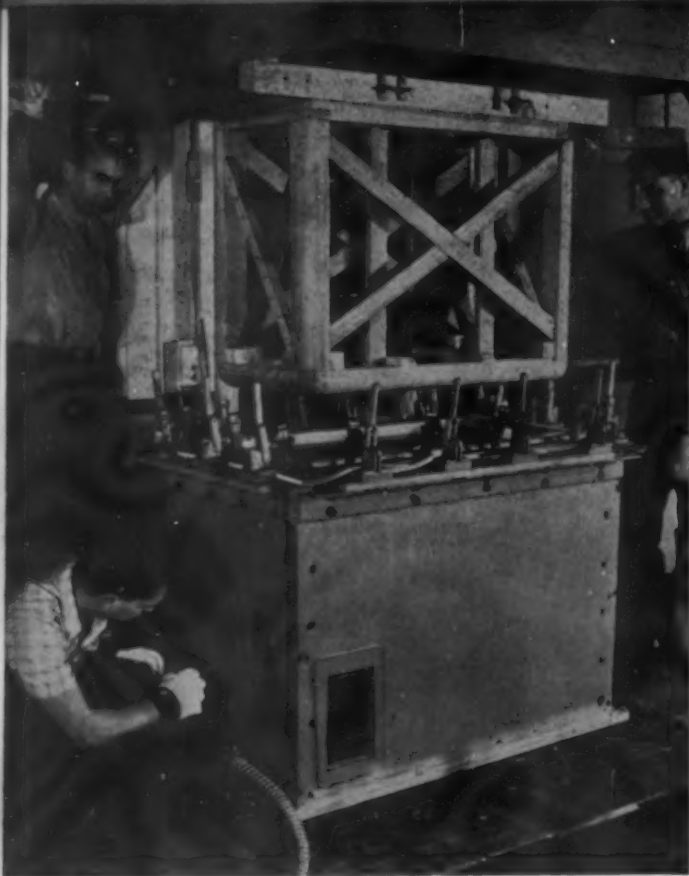
*Hot sheet is then draped over rectangular vacuum chamber and held by quick setting clamps. Vacuum chamber may be made of 5/8-in. plywood caulked with mastic material*

ing was found to mar easily on contact with the mold. Any imperfections in the surface of a mold are readily imprinted on the plastic. Mark-off, as this is called, often necessitates a polishing operation, thereby raising the cost of the finished part. The optical quality is also frequently reduced by polishing.

To keep mark-off to a minimum, molds used in forming acrylic are painstakingly made to present a surface as nearly perfect as possible. Plaster of Paris is frequently used, since it can be shaped as desired when wet

\* Supervisor of Sales Service and supervisor of Fabrication Laboratory, respectively, Rohm & Haas Co., Philadelphia, Pa.  
<sup>1</sup> Developed by Rohm & Haas Co., Philadelphia, Pa.

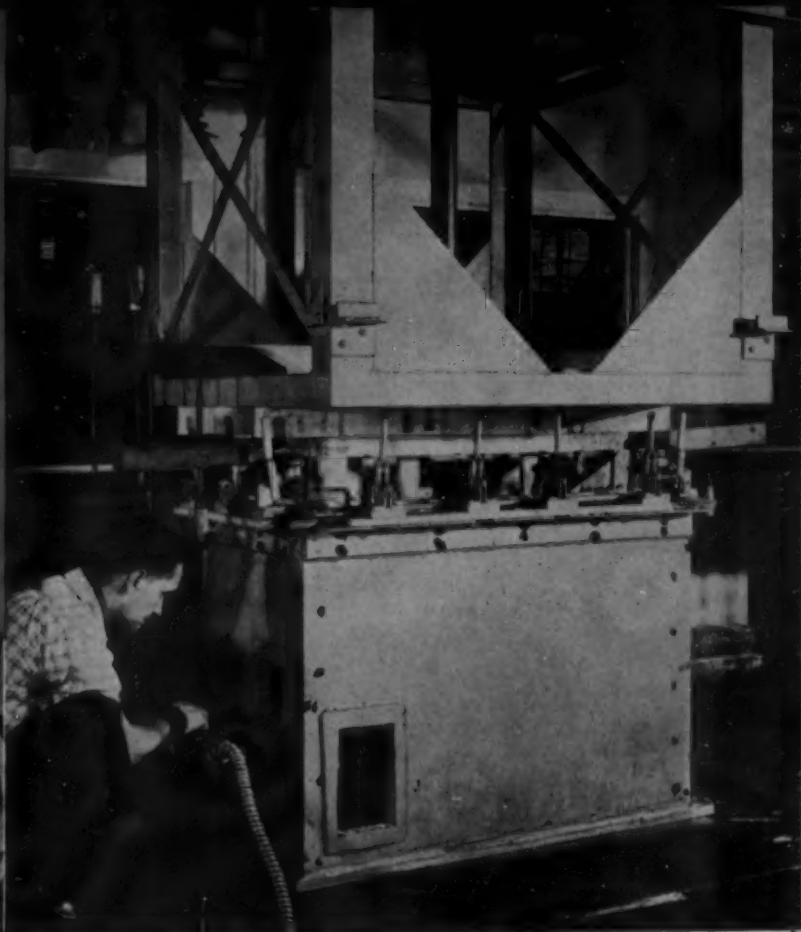
*This new method of forming sheet acrylic which features a skeleton mold and vacuum is being used to produce housings, shields, cases or covers for electrical equipment*



*Vacuum is applied and sheet is drawn into a bubble cavity. The use of recessed molds reduces mark-off since mold contacts only a relatively small area of the sheet*

and worked to a very smooth surface after it dries and hardens. Such molds also have their faults. Those of any size are heavy, cumbersome and break easily. Molds made from wood, synthetic resin or other suitable materials are also used. Because of the accuracy involved in making these molds, they are often surprisingly high in cost. Even though they may be carefully finished, they must usually be covered with flocked rubber or flannel for additional protection.

Ridge forming gets away from all these difficulties.



*After the mold is locked into position, the vacuum is released so that the heated acrylic sheet can snap back against the form and cool around outline of the mold*

Although not of universal application, the method has proved practical in forming so many shapes that it promises a major role in the plastic-forming techniques.

Basically, ridge forming is a modification of the stretch forming methods which use complete molds. The heat-softened plastic is shaped to the contour desired by actual contact with a mold, but the mold is only a wood or metal framework, rather than the complete form. In other words, the mold is designed so that it touches the plastic only in those areas that determine the final shape of the article.

In forming a rectangular plastic housing by ridge forming, for example, the heated acrylic sheet is clamped across an opening just a little larger than the horizontal cross-section of the part. Then a framework mold having the length, width and depth of the housing to be formed is inserted and pressure is applied to force the acrylic down to the shape of the mold outline.

#### **Polishing comparatively easy**

The completed housing, having been in contact with the mold only along the various edges and corners, shows no surface marring at all except on the inside of these sharp curves. In these small areas the light reflections are such that considerable mark-off may be present without the need of polishing. If mark-off is objectionable, it is relatively easy to polish the mold on the small surface areas that touch the plastic during the forming.

*(Please turn to next page)*



*Here, finished acrylic piece is removed from the mold. In this case, it is a deep tank which will be used in an X-ray laboratory. It measures 18 by 36 by 22 inches*

There are many ways in which molds for ridge forming may be made and a number of variations in the methods of using them. In some cases, a wooden box-like form serves most conveniently as the body of the mold. It is made somewhat smaller than the finished dimensions of the part being formed and may be left quite rough. Strips of hardwood, Masonite or metal are attached to the form in the places where contact with the plastic is required. These strips, of course, are given a smooth finish.

#### **Vacuum forming often desirable**

In use, if the part to be formed is shallow, pressure on the mold may be the only force needed to form the plastic. However, if the draw is more than half the width of the opening, it is often desirable to use vacuum forming first to draw the plastic to a free-blown shape a little deeper than the depth desired in the finished part. The mold is then inserted and the vacuum released in order to allow the hot plastic material to snap back into place and to cool around the outline of the mold.

#### **Technique may be adapted**

A fabricator can find many ways to adapt the basic principles of this process to the special requirements of any particular job.

For example, ridge forming makes it possible to draw different sections of a part to different depths; ridges in the inserted mold press the plastic against corresponding grooves or ridges in the vacuum pot, thus sealing off sections of the pot and permitting differential drawing. The process has many applications and may often be used to effect considerable savings in quantity production operations.

Recently, differential drawing was adapted to the joining of the acrylic section of a large Sikorsky helicopter. The assembly consists of six curved panels—two of each of three different shapes. Using a mold designed for differential ridge forming, it was possible to draw two of the three pairs from a single sheet of acrylic in one operation. When the formed sheet was cut along the ridge lines, four panels, free from mark-off and ready for installation, were obtained.

Another adaptation of the process may be used to permit multiple forming of identical parts. The ridges required to produce the individual shapes make natural dividing lines for sawing the pieces apart. In some designs, single units that, because of their shape cannot be formed easily by ordinary free-draw methods, are produced quite readily when made two at a time with ridge forming.

#### **Reverse curves possible**

Reverse curves may also be produced. This is done by using drilled, skeleton molds to which vacuum lines are attached for final shaping of the plastic after the main drawing operation is completed. The mold is first used in the usual way to stretch the plastic to the general shape required. Then the vacuum in the mold is turned on, drawing the sheet in around to conform with the mold contour.

Naturally this method can be used only in particular designs which will not lock the mold in the final vacuum drawing, preventing removal of the mold. It has been used successfully in forming shatter-resistant acrylic globes for street lights, decorative lamp shades, vases, wall lights and other objects that have a tapering basic outline.

#### **Hot ridge forming**

A variation of the ridge forming technique just discussed appears in hot ridge forming, especially valuable for making articles where a deep draw is required, with a minimum of thinning out. In this process the mold is fabricated of pipe (chrome-plated or smooth stainless steel is preferred), assembled in a manner that permits steam to circulate. When the sheet is being drawn, hot water flowing through the pipe outline of the mold keeps these sharp-bend sections of the plastic softened so that the material can slip by these ridges and can equalize the thickness of the various portions of the plastic part being formed.

#### **Advantages of new technique**

In conclusion, ridge forming effects sizable economies in the production of large numbers of identical plastic parts by eliminating, or greatly reducing, the need for subsequent polishing. It is just as useful when small quantities of each of a number of different designs are needed, because the time-consuming task of building all-over molds is replaced by the relatively simple job of building only a framework of the mold. Ridge forming, therefore, has wide industrial application and is particularly useful where transparent plastics are involved.

# A hand-operated injection machine

**I**N THE injection molding of large quantities of thermoplastic material, the need often arises for color samples and test runs. For just such tasks and many others, Moslo Machinery Co., 2443 Prospect Ave., Cleveland 15, Ohio, has developed the Minijector, a compact and versatile  $\frac{3}{4}$ -oz. hand-operated injection molding machine.

This machine meets the plastic molder's need for samples to submit to customers, test runs and small production in laboratory work, it supplies the demand for the testing of plastic materials. Colors can be checked quickly for conformity. Color chips, tensile and compression bars can also be turned out on this injection machine.

Because of its simplicity and ease of operation, it is recommended for use in high school and college classes to demonstrate the process of injection molding. It also gives students the opportunity to investigate the different types of plastic materials.

Of the vertical type, the machine has a  $\frac{3}{4}$ -in. hand-operated plunger-type ram. Turning the wheel with a force of 50 lb. will exert an injection pressure of 12,000 p.s.i. on the material. Temperature can be controlled thermostatically up to 650°.

The heart of the Minijector is the completely interchangeable cylinder and heating unit. The hopper is

mounted directly on the heating chamber and will hold 1 lb. of molding material. If the molder has several of these cylinder and heating units available, he may quickly change the machine so that it will mold different colors or different materials without necessitating purging of the material from the injection cylinder chamber. It is also possible for the molder to carry these spare loaded units at molding temperatures even though they are not mounted in the machine. This is accomplished by setting the thermostat at a temperature which will not burn the plastic material that is being molded and by merely connecting the heating element to any convenient electrical outlet.

The standard mold sets used in the press are made in two halves and measure  $3\frac{3}{4}$  in. long,  $1\frac{3}{4}$  in. wide and  $2\frac{1}{4}$  in. high. When placed in position, they are self-locking due to matching tapers on the mold set and holding fixture in the machine. Longer molds can be made to facilitate the production of odd or long-shaped pieces and parts.

The machine may be plugged into any 115-volt electrical outlet—either AC or DC—and consumes 350 watts. Two models are being made: a bench type weighing 36 lb.,  $9\frac{1}{2}$  in. wide,  $23\frac{1}{8}$  in. high and  $19\frac{1}{4}$  in. deep; a floor model weighing 144 lb., 12 in. wide,  $56\frac{1}{8}$  in. high and  $21\frac{1}{4}$  in. deep.

1—The injection cylinder, heating unit and hopper of this machine make up an integral unit which can easily be removed and replaced by another assembly to facilitate changing from one material or color to another. 2—A turn of the wheel with a force of 50 lb. exerts a pressure of 12,000 p.s.i. on the plastic being injected. 3—After molding, the die is easily slipped from the side opening of the machine and parts removed from the two-part molds

1 PHOTOS, COURTESY MOSLO MACHINERY CO.

2

3



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New York 20, New York



**BEETLE®** plastics—urea-formaldehyde thermosetting molding compounds. **MELMAC®** plastics—melamine-formaldehyde thermosetting molding compounds, industrial and laminating resins. **URAC®** resins—urea-formaldehyde thermosetting industrial resins and adhesives. **MELURAC®** resins—melamine-urea-formaldehyde thermosetting resin adhesives and laminating resins. **LAMINAC®** resins—thermosetting polyester resins. **PHENAC®** resins—phenol modified resorcinol thermosetting resin adhesives.

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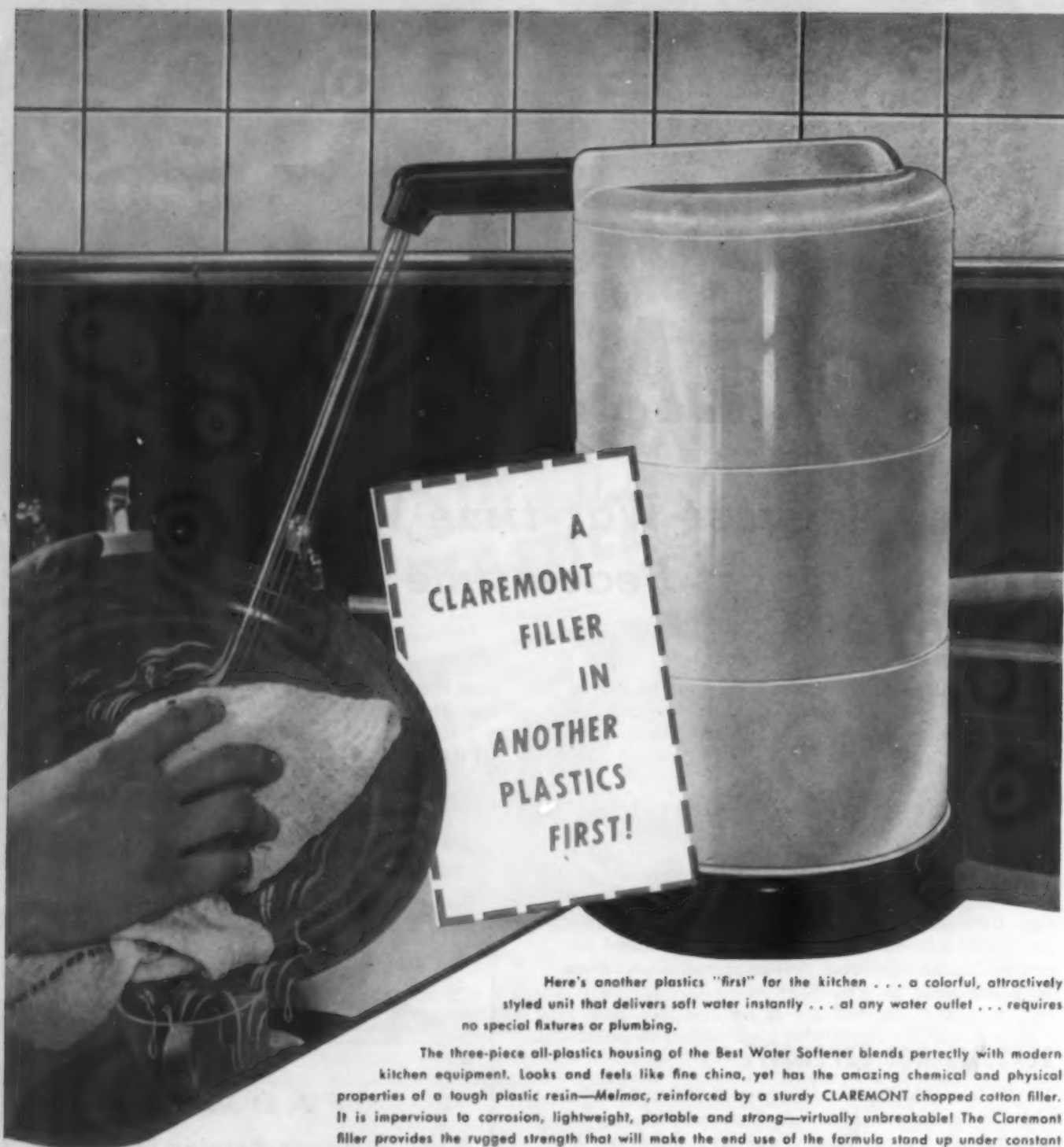
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Water Softener Unit in photograph molded by Hydropack Co., Los Angeles, Cal., for Best Manufacturing Co., out of Melmac 3020—a plastic material compounded by American Cyanamid Company.

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## Effect of catalysts and pH on strength of resin-bonded plywood\*

by G. M. KLINE, F. W. REINHART, R. C. RINKER and N. J. DE LOLLIS†

The effects of various catalysts used to cure the resinous adhesives on the strength properties of plywood were investigated, particularly with regard to the degree of acidity developed by the catalysts in the resin film and in the plywood. The flexural, impact and shear strengths, both initially and after aging, of birch plywoods bonded with urea-formaldehyde and phenol-formaldehyde resins definitely decrease as the acidity of the plywood increases, as evidenced by a decrease in pH. A correlation between decrease in strength on aging of plywood bonded with alkali-catalyzed phenolic acid and increase in alkalinity of the panel was observed.

The susceptibility of birch wood, itself, to attack by acids and alkalis was determined in order better to understand the mechanism of the deterioration of resin-bonded plywood. A marked decrease in strength occurred when the pH of the wood was lowered below 2.0. In the range between pH 2.0 and 2.5, strong acids, such as hydrochloric and sulfuric, had a more pronounced deteriorating effect than weak acids, such as hypophosphorous and nitranilic. A marked decrease in strength of the birch also occurred when the pH was raised to 8.8 by the absorption of an alkali, tetraethanolammonium hydroxide.

ties of the resins on the strength properties of the resin bonds. Information of this nature is needed to utilize the materials properly in building satisfactory aircraft and to evaluate the causes of failure. Determination of the effect of acid and alkaline catalysts on the strength and aging properties of various types of resin bonds is one important phase of this work. This report presents the results of an investigation which was made to determine these relationships. Some of the data obtained in the early stages of the work were included in a preliminary report issued in 1943.<sup>1</sup>

The degree of acidity or hydrogen ion concentration can conveniently be reported as a pH value which approximately is the logarithm of the reciprocal of the gram ionic hydrogen equivalents per liter; that is,  $\text{pH} = \log 1/\text{H}^+$  per liter. Water has a concentration of  $\text{H}^+$  ion of  $10^{-7}$  and of  $\text{OH}^-$  ion of  $10^{-7}$  mols per liter or a pH value of 7, and is said to be neutral in reaction. The presence of an acid in a water solution increases the concentration of hydrogen ions. Hence the concentration of hydrogen ions in an acid solution becomes  $10^{-6}$ ,  $10^{-5}$  or greater, and the pH value is less than 7. The presence of an alkali in a water solution increases the concentration of hydroxyl ions and decreases that of the hydrogen ions. Hence the concentration of hydrogen ions in an alkaline solution becomes  $10^{-8}$ ,  $10^{-9}$  or less, and the pH value is greater than 7. The product of the hydrogen ion concentration and the hydroxyl ion concentration is always equal to  $10^{-14}$  in aqueous medium at  $25^\circ \text{C}$ . The pH value has been used throughout this report to indicate the degree of acidity of the various specimens.

The two most commonly used types of bonding agents in the manufacture of resin-bonded plywood are the phenol-formaldehyde and the urea-formaldehyde resins. Both types are cured either by the "hot-set" or the "cold-set" method. Since the demarcation between

**I**NCREASED use of resin-bonded plywood for structural parts of aircraft has made it necessary to determine the effect of various chemical proper-

\* Abridged from an N.A.C.A. Technical Note No. 1161. The curing conditions for the test panels and the experimental data obtained in the flexural, impact, shear and delamination tests are tabulated in the N.A.C.A. report.

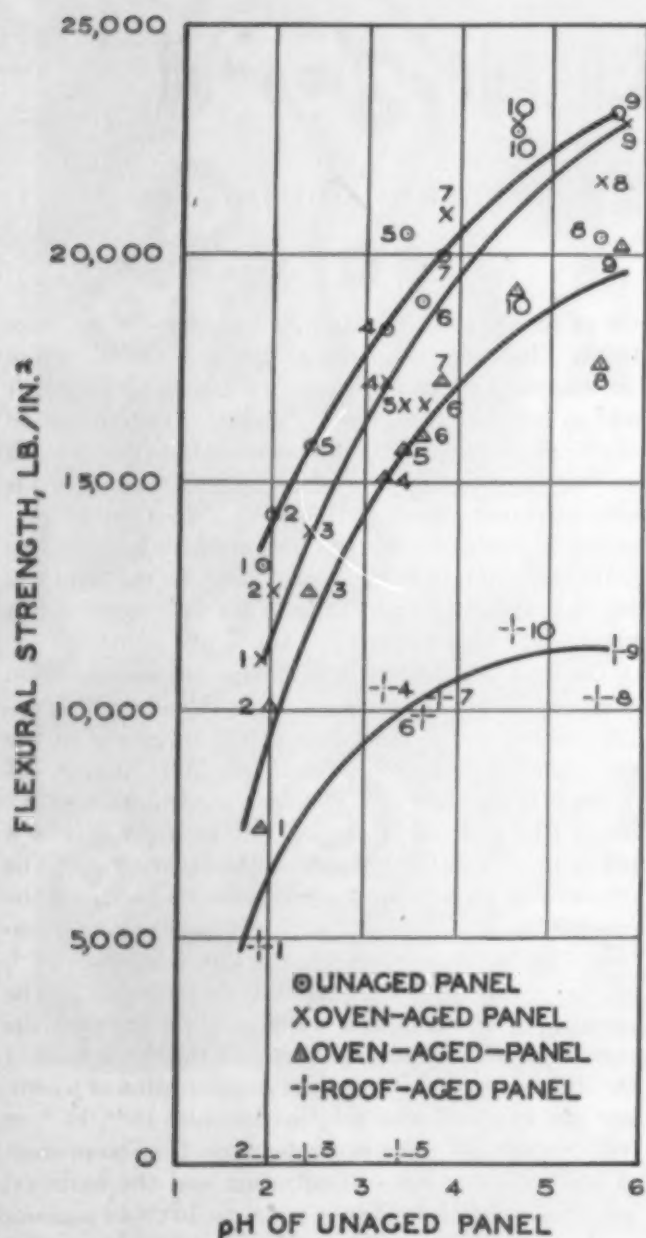
† National Bureau of Standards, Washington, D. C.

<sup>1</sup> "Effect of pH on strength of resin bonds," by R. C. Rinker, F. W. Reinhart and G. M. Kline: N.A.C.A. ARR No. 3J11 (Oct. 1943).

"cold-set" and "hot-set" bonding resins has not been definitely established in the industry, the resins used in this project were classified according to the temperature required to cure the resin in a commercially practical period of time, as follows:

**Class R.** These resins do not require a higher degree of heat for curing than that available at ordinary room or factory conditions.

**Class M.** These resins require a degree of heat greater than that available at room or factory conditions, but not over 160° F.



1—Effect of pH on flexural strength of birch plywood bonded with urea-formaldehyde resins. Sample 1) Uformite 430 and 10 percent  $\text{NH}_4\text{Cl}$ ; 2) Uformite 430 and 10 percent "Z"; 3) Uformite 430 and 10 percent "Y"; 4) Plaskon 201-2 and 2 percent "A"; 5) Casco 5 and 5 percent "AA"; 6) Plaskon 250-2 and Incorporated; 7) Plaskon 107 and 7 percent B-7; 8) Uformite 500 and no catalyst; 9) Casco 5 and no catalyst; 10) Uformite 430 and no catalyst

**Class H.** These require temperature over 160° F.

To obtain a satisfactory degree of cure of class R and some class M resins, it is necessary with most of the commercial resins to use very active catalysts. One of the most active catalysts for curing these types of resins is the hydrogen ion which is usually expressed in terms of pH units when concentration is less than one molar.

It is known that urea-formaldehyde resins are not as resistant to acid conditions as are phenolic resins.<sup>2,7</sup> The work reported herein was designed to determine the effects of various catalysts and the pH of the resin bond on the strength properties of the resin-wood composite since the failures may be in the resin, in the wood or in both resin and wood. It should be noted, however, that the acid conditions in the resin-bonded birch panels tested are attributable to the ingredients in the resin-glue mixtures, not to wood or any extraneous source.

This investigation, conducted at the National Bureau of Standards, was sponsored by and conducted with financial assistance from the National Advisory Committee for Aeronautics.

### Materials

A group of adhesives which is being used to a great extent in the manufacture of resin-bonded plywood aircraft was selected for this work. These included urea-formaldehyde, phenol-formaldehyde, resorcinol-formaldehyde, furane, and unsaturated polyester resins and casein.

Birch wood was used in the tests because it is the type most commonly employed in the manufacture of aircraft grade plywood in this country. Other woods were not investigated inasmuch as the primary objective of the investigation was the study of deteriorative effects characteristic of various resin-catalyst systems.

The test panels were made with sliced birch veneers carefully selected for straightness of grain and having an average thickness of 0.01 inch. The thin veneers were used to obtain a higher resin content than that normally used in aircraft plywood. Since the acidic conditions result from the resin, a high resin content would be expected to magnify the effect of the pH on the strength properties of the composite.

For the tests on the effect of the catalysts on the wood alone, sliced birch veneers 0.1 in. in thickness and specially selected for straightness of grain were used.

### Preparation of test panels

The resin glues were prepared according to directions received from the manufacturers and were applied to

2. "Chemical factors involved in the gluing of wood with cold-setting urea-formaldehyde resins," by W. G. Campbell. J. Soc. Chemical Industry, Vol. 61, 1942, pp. 161-162.

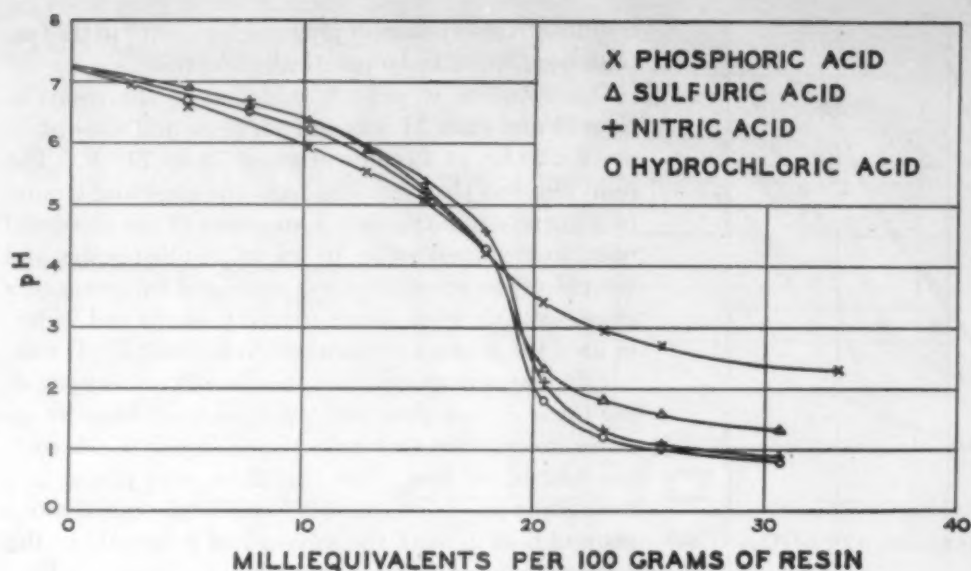
3. "Chemical factors involved in the gluing of wood with cold-setting urea-formaldehyde resins," by W. G. Campbell and D. F. Packman. Second Report. "Effects induced by cold-setting urea-formaldehyde glues on the physical properties of wood in wood-glue composites." Ministry of Aircraft Production, Sci. Tech. Mem. No. 11/43-F.P. 5 (1943).

4. "Chemical factors involved in the gluing of wood with cold-setting urea-formaldehyde resins," by W. G. Campbell and S. A. Bryant. Third Report. "A consideration of the causes of the decline in failing load of gap joints during prolonged storage under controlled conditions." Ministry of Aircraft Production, Sci. Tech. Mem. No. 9/44-F.P. 16 (1944).

5. "Summary of information on the durability of aircraft glues," by F. F. Wangaard, Forest Products Laboratory Report No. 1530 (May 1944).

6. "Synthetic resin glues," Forest Products Laboratory Report No. 1336 (April 1945).

7. "Significance of pH in glued wood joints," by A. P. Dowling, Naval Air Material Center Report No. NAM 2583, Part V (June 1944).



the birch veneers by means of rollers. This method produced resin films of uniform thickness on both sides of the veneers. The veneers coated with the class H resins were suspended from a drying rack and allowed to dry about 20 hr. before assembling and pressing. The veneers coated with the class R and class M resins were assembled and pressed immediately after coating. Each panel consisted of eight birch veneers arranged with the grain of plies one, three, six and eight parallel to one another and with the grain of plies two, four, five and seven perpendicular to the face plies.

In the early stages of the investigation the test panels were pressed at approximately 100 p.s.i., but this produced panels varying considerably in thickness and density. To obtain more uniform panels stops 9 by 1 in. for use between the press platens were ground to a thickness of  $0.075 \pm 0.001$  in. and the platens were ground to a flatness of 0.0001 inch. A load of 10 tons was applied to the platens.

The birch veneers used in each panel were conditioned

by storage at 77° F. and 50 percent relative humidity, and were weighed before the resin coating was applied. The completed test panel was also conditioned and weighed. Three panels were prepared with each resin or resin-catalyst mixture. The average resin content of the test panels was 33 percent.

#### Testing procedures

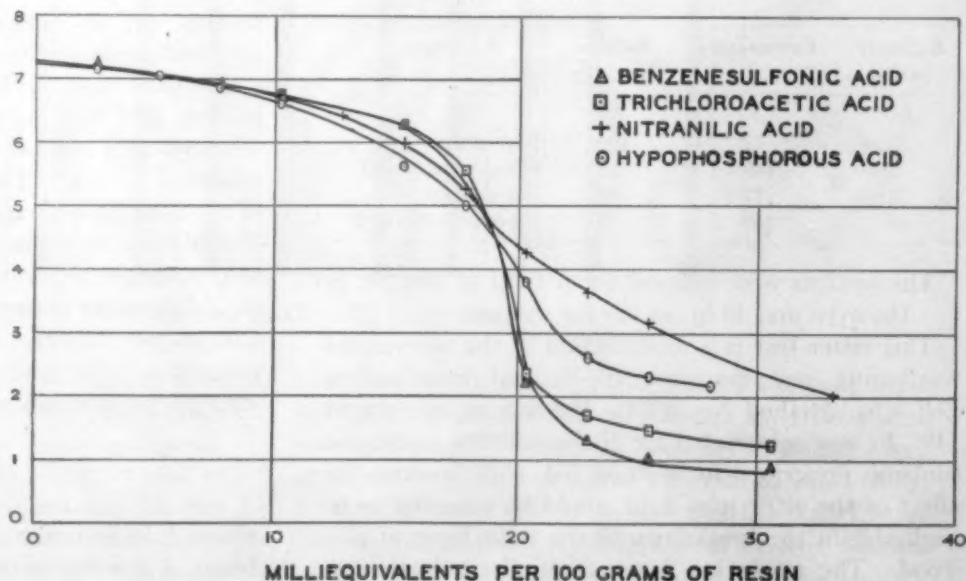
**Aging**—Each test panel was cut into quarters and treated as follows:

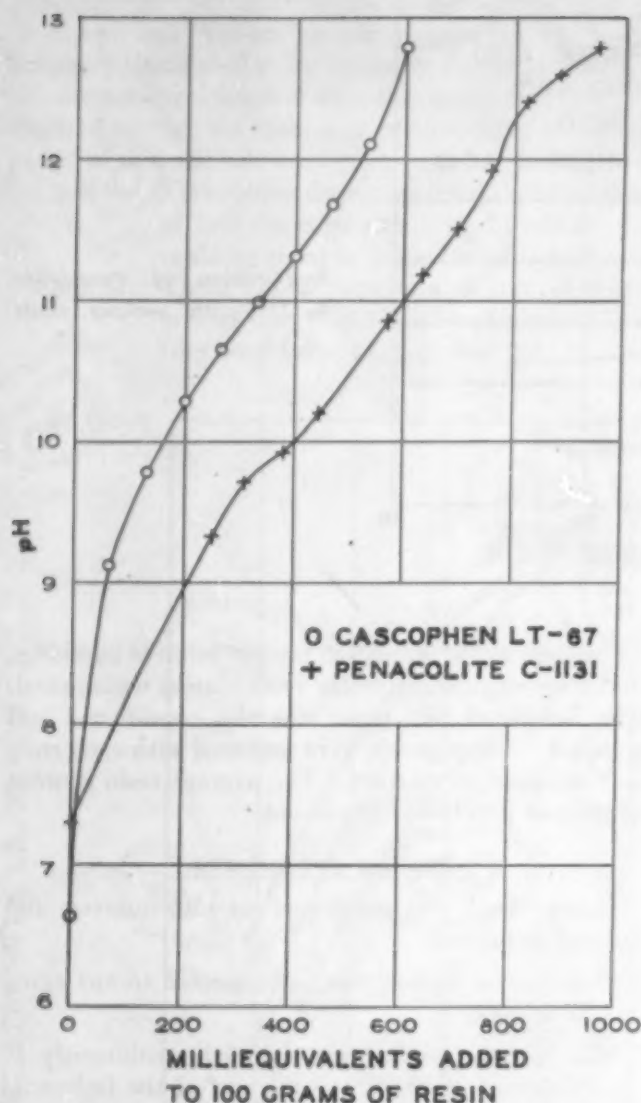
One quarter section was not subjected to any aging treatment.

One quarter section was exposed continuously in Washington, D. C. (on the roof of the Industrial Building, National Bureau of Standards) on racks at an angle of 45° facing south for one year unless otherwise noted.

One quarter section was heated in a forced-draft oven at 176° F. for 40 hours. (Please turn to next page)

3—Titration of Penacolite G-1131 with various acids





4—Titration of phenol and resorcinol resins with sodium hydroxide

One quarter section was subjected to a continuous oven-fog cyclic accelerated aging test. The cycle in this test consisted of the following:

Exposure period	Temperature	Relative humidity	Apparatus
hr.	° F.	%	
2	77	100	Fog cabinet
2	149	5	Forced-draft oven
2	77	100	Fog cabinet
18	149	5	Forced-draft oven

The sections were exposed for a total of 200 hr. in the oven and 40 hr. in the fog cabinet.

This latter test is a modification of the accelerated weathering test described in Federal Specification L-P-406a, Method No. 6021. Heating in an oven at 149° F. was substituted for the irradiation under the sunlamp prescribed in Method No. 6021 because the effect of the ultraviolet light would be expected to be negligible in the breakdown of the resin layer in plywood. The respective decreases in flexural strength

resulting from exposure of plywood specimens to the two tests were found to be practically identical.

**Determination of pH**—A thin film of the resins of class R and class M was cast on glass and allowed to dry for 20 hr. at a temperature of 70 to 79° F. The resin film was then removed from the glass and ground to a fineness of 40 mesh. Two grams of the powdered resin were suspended in 10 ml. of distilled water and the pH of the suspension was measured by means of a glass electrode after 15 min. and 24, 48, 72 and 96 hr., or until the values were constant to within 0.05 pH unit.

Films were prepared from the class H resins by casting them upon a glass plate, using a knife blade to remove excess resin and make the thickness of the coating 0.02 in. or less. The cast films were placed in a circulating-air oven at 149° F. until examination showed that most of the solvent had evaporated; this process required about 4 hr. except in the case of Plaskon 107, which was cured after 3 hr. at 149° F. and was not subjected to any further heating. This drying was followed by a cure in the oven at 300° F. until the films were hard and brittle, the latter operation requiring about 30 minutes. The hard, brittle films were pulverized in a small rock-crushing mortar and passed through a 40-mesh screen. The pH values of the powdered films were measured in the same manner as those of the class R and the class M films.

The acidity of the test panels was determined by grinding a portion of the panel to 40 mesh in a Wiley mill and suspending 1 gram of the powder in 5 ml. of distilled water. The pH values of the water suspensions were usually constant after 48 hours.

The pH of the distilled water used in making the resin suspensions was 6.3. All the pH measurements were made at a temperature of 77° F. with a glass electrode. The measurements reported are accurate to  $\pm 0.05$  pH unit.

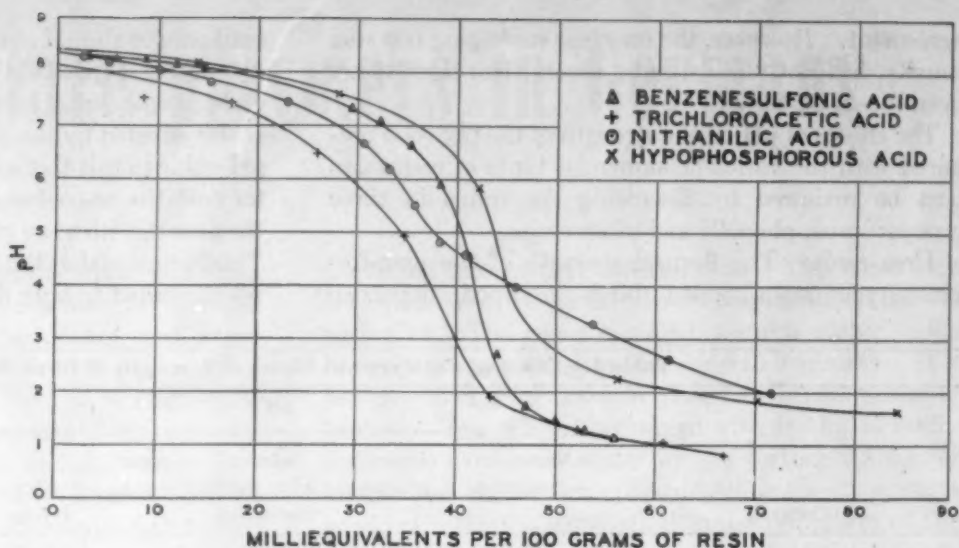
**Flexural strength**—The test specimens for determining the strength properties were cut from the quarter sections after the aging treatments. The specimens were machined and then conditioned at 77° F. and 50 percent relative humidity for at least 48 hr. prior to testing. All the tests were made at 77° F. and 50 percent relative humidity.

The flexural strength was measured on specimens 1.0 in. long and 0.75 in. wide cut from the panels. The specimen was supported on two parallel supports with a span of  $\frac{5}{8}$  inch. The load was applied at the center of the span by a pressure piece similar to the supports. The edges of the support pieces and of the pressure piece were rounded to  $\frac{1}{8}$ -in. radius. The tests were made on a hydraulic testing machine with a head speed of 0.05 in. per minute. The machine was accurate to 2 percent of the lowest applied load. The flexural strength or modulus of rupture is calculated from:

$$F = \frac{3PL}{2AH^2}$$

where  $F$  is flexural strength,  $P$  is load,  $L$  is length of beam,  $A$  is width of beam and  $H$  is thickness of beam.

5—Titration of Cascophen LT-67 with various acids



**Delamination**—One strip 0.5 in. wide cut from each quarter section of each test panel was subjected to a delamination test. The strips were placed in individual 3- by 20-cm. test tubes which contained distilled water previously heated to the boiling point by immersion of the tubes in a water bath. The tubes containing the test strips were left in the bath of boiling water for 1 hour. On removal from the test tubes the specimens were immersed in water at 77° F. for 15 min. and then dried at 140° F. in a forced-draft oven for 22 hours. This procedure constituted one cycle of the test. At the end of each cycle the test specimens were bent over a mandrel of 8-in. radius. After five cycles the specimens were bent over a 4-in. radius mandrel. Observations regarding delamination were made.

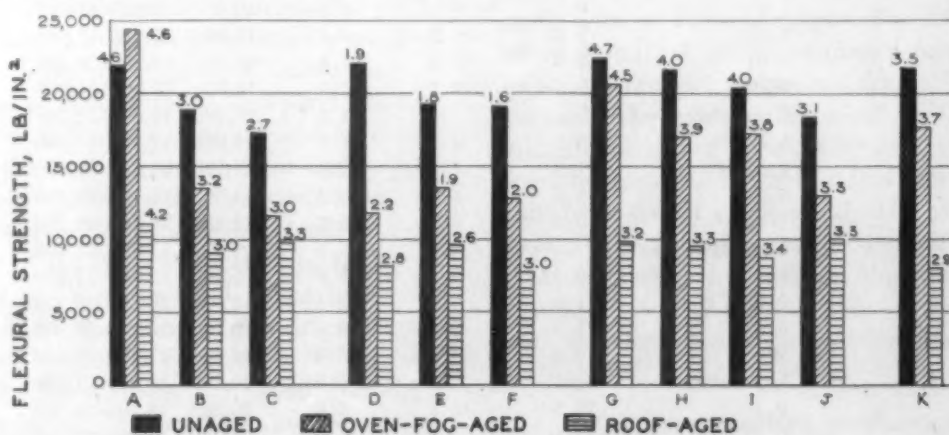
#### Tests of industrial adhesives

Use of the various commercial resins with their catalysts selected for this investigation resulted in pH

values for birch plywood ranging from 1.7 to 8.4. The ranges of pH for the test panels made from the various resins were as follows: urea-formaldehyde, 1.9 to 5.7; phenol-formaldehyde, 1.7 to 8.4; resorcinol-formaldehyde, 4.8 to 6.3; and unsaturated polyester resins, 3.2 to 5.7.

The pH values of birch plywood were not affected by moderate baking or by exposure to cycles of heat and fog. This indicated that the acidic compounds determining the pH of the composite did not escape readily from the structure or did not react with the birch or its decomposition products in such a way that they lost their chemical identity. It would seem reasonable, therefore, to assume that the deterioration caused by pH would continue until failure occurred.

The results of the 240-hr. oven-fog-aging test are in qualitative agreement with the results of the one-year roof-aging test. An analysis of the data indicates that no quantitative statements can be made concerning the



6—Effect of various catalysts on flexural strength of birch plywood bonded with phenolic. Number above each column of chart indicates pH value of unaged panel. Samples A) Durez 12041, B) Bakelite XC-11749 and C) Bakelite XC-3931, all with 3.2 percent Bakelite XK-2997 as catalyst; D) Bakelite XC-11749, E) Durez 12041 and F) Bakelite XC-3931, all with 10 percent Durez 7422 as cata-

lyst. Samples G) Bakelite XC-11749 and 5 percent Bakelite XK-11753 as catalyst; H) Bakelite XC-11749 and 20 percent Bakelite XK-11753 as catalyst; I) Bakelite XC-11749 and 30 percent Bakelite XK-11753 as catalyst; J) Bakelite XC-11749 and 45 percent Bakelite XK-11753 as catalyst; K) Bakelite XC-3931 and 45 percent Bakelite XK-11753 as catalyst

agreement. However, the one-year roof-aging test was usually, but not always, more severe than the 240-hr. oven-fog-aging test.

The effects of pH on the strength of the plywood prepared with the various commercial types of resins can best be reviewed by discussing the resins in three groups: urea, phenolic and other resins.

*Urea resins*—The flexural strength of the urea-formaldehyde resin-bonded birch plywood depended

markedly on the pH of the composite. This is shown by data in Fig. 1 (page 124). The failure of urea-formaldehyde resin-bonded materials in the delamination test is also affected by the pH of the plywood. The critical pH value in this test appears to be between 3.8 and 4.6 for both the unaged and the aged specimens. Three of the panels, with a low pH, delaminated during exposure. This indicates that the loss in strength on roof aging can be attributed to both deterior- (Please turn to page 196)

Table I.—Effect of Catalysts on Flexural Strength of Birch Veneers\*

Catalyst	Normality of solution	pH			Flexural Strength Data			
		Original solution	Solution after wood immersion	Ground wood	Flexural Strength		No. of specimens	Loss in strength <sup>b</sup>
					Average	Range		
					p.s.i.	p.s.i.		%
Hydrochloric acid	1.0	0.12	0.03	1.5	9,800	8,600–12,800	10	52.2
	0.1	1.1	1.4	2.4	14,900	13,000–16,500	12	27.3
	0.01	2.0	3.1	4.0	18,100	16,800–18,900	12	11.7
	Water	5.5	5.2	5.6	18,700	17,100–20,000	12	8.8
	Untreated wood*	...	...	6.0	20,500	19,100–22,700	12	...
Nitric acid	1.0	0.1	0.21	1.6	12,300	10,800–13,800	12	42.0
	0.1	1.1	1.4	2.4	17,100	16,100–18,800	12	19.3
	0.01	2.0	3.4	4.2	20,400	18,900–22,700	12	3.8
	Water	5.5	4.9	5.3	20,700	18,900–22,200	12	2.4
	Untreated wood	...	...	5.8	21,200	19,100–22,900	12	...
Sulfuric acid	1.0	0.33	0.34	1.5	12,300	10,700–13,400	12	38.2
	0.1	1.3	1.4	2.4	16,400	14,700–17,700	12	17.6
	0.01	2.1	3.1	4.2	19,200	17,800–20,800	12	3.5
	Water	5.6	5.5	5.4	19,300	18,500–20,400	12	3.0
	Untreated wood	...	...	5.5	19,900	18,900–21,600	12	...
Phosphoric acid	3.0	0.8	0.88	1.8	15,000	13,900–16,700	12	25.0
	0.3	1.6	1.8	2.4	18,000	16,600–19,200	12	10.0
	0.03	2.2	3.2	4.1	18,600	15,600–20,100	12	7.0
	Water	5.5	6.0	5.4	18,500	16,800–20,800	12	9.2
	Untreated wood	...	...	5.5	20,000	17,600–23,400	12	...
Hypophosphorous acid	1.0	0.6	0.72	1.5	14,700	12,900–16,900	12	28.3
	0.1	1.3	1.6	2.2	19,300	17,400–20,400	12	5.9
	0.01	2.2	3.1	4.0	19,900	18,900–20,700	12	2.9
	Water	5.5	5.2	4.7	19,800	18,100–20,300	12	3.4
	Untreated wood	...	...	4.9	20,500	19,500–21,200	12	...
Benzenesulfonic acid	1.0	0.1	0.18	1.1	10,400	9,600–11,300	12	49.0
	0.1	1.1	1.2	2.1	16,100	13,900–17,800	12	21.1
	0.01	2.0	3.2	3.8	18,900	16,900–20,400	12	7.4
	Water	5.5	5.4	5.0	18,800	17,300–21,000	12	7.8
	Untreated wood	...	...	4.9	20,400	18,900–22,700	12	...
Trichloroacetic acid	1.1	0.1	0.56	1.2	14,000	12,400–15,100	12	27.5
	0.11	1.2	1.1	2.4	17,100	15,600–19,400	12	11.4
	0.01	2.1	2.7	4.2	17,300	15,400–19,100	12	10.4
	Water	5.9	5.0	5.2	18,200	16,500–20,200	12	5.7
	Untreated wood	...	...	5.3	19,300	17,000–21,400	12	...
Nitranilic acid	1.0	0.42	0.80	1.8	16,600	15,500–17,800	12	19.4
	0.2	1.0	1.6	2.4	18,800	18,200–19,900	12	8.7
	0.02	1.9	2.7	3.8	18,900	18,100–20,400	12	8.2
	Water	5.5	5.0	5.3	19,400	17,700–20,000	12	5.8
	Untreated wood	...	...	5.8	20,600	19,700–21,200	12	...
Sodium hydroxide	0.1	12.9	10.2	7.0	20,200	18,700–22,300	12	6.0
	0.01	12.0	6.0	6.2	20,100	17,900–22,300	12	6.5
	Water	5.8	5.0	5.4	20,100	18,800–21,700	12	6.5
	Untreated wood	...	...	5.7	21,500	20,700–22,400	12	...
Tetraethanolammonium hydroxide	0.44	12.4	11.7	8.8	16,300	12,800–17,900	12	20.1
	0.22	12.1	8.8	7.1	19,000	17,700–21,100	12	6.9
	Water	5.6	5.0	5.1	20,100	18,200–21,300	12	1.5
	Untreated wood	...	...	5.5	20,400	18,900–22,500	12	...

\* A birch veneer of 0.1-in. thickness was cut into the required number of specimens for treatment with a single catalyst. The specimens for immersion in each concentration of the catalyst for three days were selected to be representative of the whole veneer. Two similar sets of specimens from the same veneer were tested untreated and after immersion in distilled water for 3 days, respectively.

<sup>b</sup> The percentage loss in flexural strength is calculated on the basis of the strength of the untreated wood from the same veneer.

# Methacrylate polymers in Germany\*

**T**HIS ARTICLE describes the compositions and processes used in the manufacture of German methacrylate polymers. The Rohm and Haas firm was the sole producer of these materials in Germany. They had two plants. The one at Darmstadt produced at the peak 18,000 sq. meters of Plexiglas per month (130 to 150 tons); the one at Mittenwalde produced 35,000 sq. meters per month (170 tons). Thicknesses ranged from 5 to 50 mm., averaging 6 to 7 mm. for aircraft enclosures in 1944. The peak production of methacrylate molding powder was 12 to 15 tons per month, reached in 1943; that of dental powder was 15 tons per month in 1944. The plant at Darmstadt was approximately 75 percent destroyed by bombing in 1944. The plant at Mittenwalde, near Berlin, was said to have been damaged by fire and looting by foreign workers.

## Methyl methacrylate monomer

Methyl methacrylate monomer is made by the standard acetone cyanohydrin method, using batch procedure. The process is carried out in four steps.

*First step*—Acetone cyanohydrin is added to 100 percent sulfuric acid. The charge per batch is:

- 240 liters 98 percent acetone cyanohydrin
- 195 liters 100 percent sulfuric acid
- 0.5 kg. tannin (polymerization inhibitor)

This step is carried out in a lead-lined or enameled steel vessel provided with stirrer and a cooling water jacket. The tannin is dissolved in the sulfuric acid in the reaction vessel and the cyanohydrin is run into the stirred and cooled acid at such a rate as to maintain a temperature of 80° C. in the mixture (about 30 minutes).

*Second step*—As soon as all the cyanohydrin has been added, the mixture is run into a second lead-lined steel vessel in which the acetone cyanohydrin and sulfuric acid complex is converted into methacrylamide sulfate. This has also a stirrer and a jacket for steam heating. The temperature of the mixture is raised to 125° C.—this takes only a few minutes—and it is kept at this temperature for 20 min., stirring all the time. At the end of this period, the charge is cooled to 90° C., and run into a large intermediate storage vessel, lead-lined without stirrer or jacket. Six methacrylamide charges are filled into this vessel before the next step is undertaken. Operation of the process is accelerated by having the first step vessels duplicated. These vessels are used alternatively to mix cyanohydrin and sulfuric acid; both discharge into the same second-step reactor.

*Third step*—When six batches have been collected in the intermediate storage vessel, the methacrylamide is

converted into methyl methacrylate. This third step is carried out in a cylindrical steel reactor which is lined with tiles. The vessel has a silicon iron stirrer which has good corrosion resistance—life 6 to 9 months. It is not provided with a steam jacket or other means of heating. The reactor is charged with 840 kg. of methanol and 400 kg. of water with a further 0.5 kg. of tannin and the methacrylamide-sulfuric acid mixture is added. Heat is evolved, at first by dilution of the sulfuric acid, later by reaction, and the addition is made at such a rate that the temperature is kept at 92° C. Toward the end of the addition the temperature falls back to 85° C. A lead-lined steel reflux condenser is attached, but little condensation occurs. The refluxing vapor has a temperature of 50° C. The reaction takes two to three hours.

*Fourth step*—The methyl methacrylate which has been formed is removed from the reaction mixture by steam distillation. The charge is run out of the esterification reactor into a horizontally disposed cylindrical tile-lined steel vessel which has a vapor pipe (enameled iron) leading to a condenser. Steam is blown in; the ester is removed as vapor and condensed. The condensate is washed with water in a copper vessel, the ester layer separated, and methanol and methyl methacrylate recovered from the water washings by fractional distillation. The sulfuric-acid-containing residue from the steam distillation is thrown away.

The washed ester is purified by redistillation in a continuous column approximately 12 m. high and 50 cm. wide. The column is made of aluminum and packed with pottery Raschig rings. The feed is halfway up the column. A trickle of phenol passes down the column to prevent polymerization. Water binary is topped; dry ester is taken off at the bottom. Redistillation is carried out at 30 to 50 mm. pressure, the ester boiling at 40 to 50° C. It is condensed with water and brine-cooled condensers. The yield of pure ester is said to be 80 to 83 percent, based on the cyanohydrin. The monomer is stored in aluminum or glass-lined tanks. It is 99.9 percent pure. Methyl oxy-isobutyrate and methyl ether are particularly undesirable impurities.

## Cast methyl methacrylate

*Standard procedure*—Monomer is brought from the storage tanks to the casting shop in aluminum and glass-lined tanks. The monomer containing 3 to 4 percent dibutyl phthalate plasticizer for making regular Plexiglas M33 is thickened for casting by heating in a stirred stainless steel vessel with 0.02 percent benzoyl peroxide. The temperature is raised to the boiling point. Thickening is carried out to an empirical test,

\* "Investigation of German plastics plants. Part I," by G. M. Kline, J. H. Rooney, J. W. C. Crawford, T. Love and F. J. Curtis, PB 949.

and takes about 8 minutes. The syrup is then cooled for cell filling without filtration.

Five to 10 percent of the production is unplasticized (Plexiglas M222). This is said to be used for optical purposes.

The cells are made from approximately  $\frac{3}{8}$  in. thick plate glass. Standard size is 1000 by 700 mm. Paper only is used to seal the cells. The sheets are separated to required distance (5 to 50 mm.) by three strips of Pertinax (phenolic laminate) about 25 mm. wide and 1200 mm. long. The edges are sealed by high wet strength paper strips (Hydrolid) using Collidin (starch) adhesive. The cells are placed on a belt conveyor and dried. The Pertinax strips are pulled out before filling. A weighed amount of syrup is run into the glass mold tilted slightly from the vertical to allow air bubbles to escape.

Polymerization of the syrup in the cells is carried out in a series of ovens with circulating air. The sealed-off molds are laid flat in an oven with supports at the sides and rollers along the middle. The cells pass through the ovens according to the following schedule:

1st Oven	55° C.	8 hr.
2nd Oven	50-62° C.	8-10 hr.
3rd Oven	85-125° C.	8 hr.

Before 1937 Plexiglas was made by copolymerization with 4 percent butyl acrylate, but this product was no better than the polymer plasticized with 4 percent di-butyl phthalate and was dropped.

The Plexiglas used for forming aircraft windshields was annealed by heating in an oven at 120 to 150° C. for 10 minutes. Paper was applied to the sheets with gelatin adhesive for protection against scratches.

#### New process

A new process was being worked on but had not been put in production when the air raid of September 1944 put the factory out of commission. In this plant, the

1—Filling machine for casting methyl methacrylate sheets



2—Close-up of a filling machine used for the casting of methyl methacrylate sheets

cells were to be filled with unpolymerized, unthickened monomer in a special filling machine and the polymerization was to take place in a waterbath instead of an airbath. The cells were to be stacked flat in crates which were to be immersed in the waterbath. On completion of this cycle, the cells were to be heated in steam to finish the polymerization, and possibly allow of retraction. The glass plates used in building the casting cells were obtained from a French firm located at Thocerottee, near Château-Thierry; they were more uniformly flat than those obtainable in Germany.<sup>1</sup>

*Filling machine*<sup>2</sup>—This is illustrated in Figs. 1 and 2. Figure 1 shows the rectangular frame mounted on up-rights by trunnions. The frame can be rotated round a horizontal axis by gear operating on the trunnions and actuated by the hand wheel seen on one of the up-rights. The rotation makes it possible to fill the cell in the vertical position, and after sealing, turn it horizontal for sliding off to the roller-conveyor system leading to the polymerization baths.

The 1600 by 1900 mm. platens which hold the glass cell walls are mounted in the frame. The faces of the platens are grooved and connected to a vacuum line, so that the plate glass cell components are held against them by suction. The upper platen can be moved across the frame, so as to make possible adjustment of the thickness (5 to 50 mm.) of the space between the cell plates. The hand wheel by which the adjustment is made can be seen between the platen and the frame (Fig. 2). The screw with tommy bar set in the frame is for locking the platen screw.

The lower platen is provided with four adjusting screws at the corners to allow of taking up lack of parallelism in the plate glass, by slightly tilting the platen in the required direction. The small hand wheels making the adjustment are seen below the lower platen. The vacuum leads to the platens (for holding the glass plates against them) are taken from the pipe mounted on the right hand (*Please turn to page 204*)

<sup>1</sup> "Plastics and wood in the German aircraft industry," by R. M. Houghton, PB 1407.

<sup>2</sup> The photographs of the equipment used in the new process were made available through the courtesy of Mr. R. H. Richardson.



*Tulox fly-rod case by Extruded Plastics, Inc., Norwalk, Conn.*

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# TENITE AN EASTMAN PLASTIC

# Technical Briefs

Abstracts of articles on plastics in the world's scientific and engineering literature relating to properties and testing methods, or indicating significant trends and developments.

## Engineering

**EFFECT OF MOISTURE CONTENT OF WOOD ON JOINT STRENGTH.** W. Z. Olson. *Wood Products* 51, Nos. 8, 38, 40, 42 (1946). Phenol, resorcinol and melamine resin adhesives, both room and intermediate-temperature setting, give strong joints with birch and maple with moisture contents between 6 and 21 percent. Phenol and resorcinol resin adhesives give strong joints with birch with a moisture content of 2 percent; melamine resin adhesives do not.

**REPPE'S ACETYLENE CHEMISTRY.** M. H. Bigelow. *Chem. Eng. News* 25, 1038-42 (Apr. 14, 1947). The methods of synthesis of organic compounds from acetylene under high pressure with various catalysts developed by Walter Reppe are reviewed.

## Chemistry

**DISTRIBUTION OF THE MOLECULAR WEIGHT OF NYLON AS DETERMINED BY FRACTIONATION IN A PHENOL-WATER SYSTEM.** G. B. Taylor. *J. Am. Chem. Soc.* 69, 636-44 (Mar. 1947). Polyhexamethylenedipamide was fractionated into 46 cuts in a phenol-water two-liquid-phase system at 70° C. The molecular weight distribution was found to follow that predicted by the Flory equation based on the premise that in bifunctional reactions to form linear polymers, the activity of a functional group is independent of the length of polymer chain to which it is attached.

**MECHANISM OF EMULSION COPOLYMERIZATION OF STYRENE AND ITACONIC ACID.** R. G. Fordyce and G. E. Ham. *J. Am. Chem. Soc.* 69, 695-6 (Mar. 1947). The wide divergence between the monomer-copolymer composition curves for the system styrene-itaconic acid determined in solution and in emulsion is interpreted in terms of an oil phase mechanism for emulsion polymerization.

**MECHANISM OF EMULSION COPOLYMERIZATION OF STYRENE AND ACRYLONITRILE.** R. G. Fordyce and E. C. Chapin. *J. Am. Chem. Soc.* 69, 581-3 (Mar. 1947). Proximity of the monomer-polymer composition curves for the system styrene-acrylonitrile determined for mass emulsion methods of polymerization, is interpreted as giving support to an oil phase mechanism for emulsion polymerization. Data are re-

ported to show that an oil phase mechanism operates in emulsion copolymerization for oil-soluble and water-soluble catalysts.

**STUDIES OF MOLECULAR HETEROGENEITY.** R. H. Blaker, R. M. Badger and R. M. Noyes. *J. Phys. & Colloid Chem.* 51, 574-9 (Mar. 1947). The absolute value of the Staudinger constant for cellulose nitrate in acetone was determined by means of measurements of osmotic pressure and of viscosity and by the use of data previously reported in the literature. Measurements of number-average and weight-average molecular weights on six commercial cellulose nitrates indicate that materials prepared from wood pulp are distinctly more heterogeneous molecularly than those prepared from cotton linters.

## Properties

**WATER ABSORPTION BY FOILS OF PLASTICIZED VIPLA.** P. Musso. *Materie plastiche* 12, 26-31 (1946); *Chem. Abstracts* 40, 6877 (Nov. 10, 1946). The moisture absorption of plasticized polyvinyl chloride films was investigated. The type of polyvinyl chloride and the kind of plasticizer was varied. Tests were made at 20, 50 and 70° C. for immersion periods of 1, 3, 5, 7, 10 and 30 days. Removing emulsifiers from the resins reduces water absorption markedly. The water absorption of these plastics is typical of the composition and reversible. Immersion causes the films to become opaque, weaker and more flexible, and to swell. The water absorption values can be used to identify a particular polyvinyl chloride and plasticizer combination. Materials with high absorption values are useful in dyeing, printing and sizing.

**REFRACTOMETRIC DETERMINATION OF SECOND-ORDER TRANSITION IN POLYVINYL ACETATE.** R. H. Wiley. *J. Polymer Sci.* 2, 10-11 (Feb. 1947). The refractive index-temperature data for polyvinyl acetate show a second-order phase transition temperature of 24° C.

## Testing

**HARDNESS AND ABRASION RESISTANCE OF PLASTICS.** L. Boor, J. D. Ryan, M. E. Marks and W. F. Bartoe. *ASTM Bulletin* 1947, 68-73 (Mar. 1947). Twenty-five representative samples of typical commercial plastics were tested by several procedures, for properties associated with the descriptive

term "hardness." The tests included various indentation, scratch and wear methods. The indentation methods included Knoop, Alpha Rockwell, Beta Rockwell, four modifications of the M Rockwell, R Rockwell, Barcol, Shore Scleroscope and Sward Rocker. The scratch methods included Bierbaum, Kohinoor and Moh. The wear methods included falling emery mar resistance and Taber abrasion. At least five types of behavior, each one contributing in various degrees to the values obtained in any test method, were observed.

## Synthetic rubber

**LIGNIN FOR REINFORCING RUBBER.** J. J. Keilen and A. Pollak. *Ind. Eng. Chem.* 39, 480-3 (Apr. 1947). Lignin, as made from the waste black liquor of the sulfate wood pulp process, is an effective reinforcing agent for synthetic or natural rubbers when incorporated into the latex by the coprecipitation or master batching procedure. GR-S, reinforced in this manner with 38.5 volumes of lignin, yields vulcanizates having a tensile strength of 2900 p.s.i. and a tear resistance of 380 lb./in., values exceeded only with channel black. With 77 volumes loading, the tensile strength of 2800 p.s.i. and tear resistance of 550 lb./in. are higher than those for any other pigment tested. In abrasion resistance lignin vulcanizates are between channel blacks and the common inorganic fillers. Shore hardness values are close to those for channel black. Lignin-reinforced rubbers weigh appreciably less per unit volume owing to the low specific gravity, 1.3, of lignin. The brown color of lignin permits a wide color range, without sacrifice of mechanical properties, by blending with white pigments. Lignin coprecipitates require only a brief milling time for complete mastication. Details are given on the preferred procedure for preparing master batches of lignin and GR-S. Other suggested incorporation procedures made possible by the colloidal properties of lignin are reviewed.

**CALCULATION OF MOLECULAR WEIGHTS AND INTRINSIC VISCOSITIES OF POLYMERS FROM MERCAPTAN CONSUMPTION DATA.** W. E. Harris and I. M. Kolthoff. *J. Polymer Sci.* 2, 72-81 (Feb. 1947). An empirical equation is described which predicts the intrinsic viscosities of 75:25 butadiene-styrene emulsion copolymers from data on mercaptan consumption.



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133

# Plastics Digest

This digest includes each month the more important articles of interest to those who make or use plastics. Mail request for periodicals directly to publishers.

## General

**DIMENSIONAL STABILIZATION OF WOOD.** A. J. Stamm and H. Tarkow. *J. Phys. & Colloid Chem.* 51, 493-505 (Mar. 1947). It is shown that wood can be acetylated by a vapor-phase treatment with acetic anhydride and pyridine so as to avoid breakdown of the wood structure. This treatment gives the highest degree of dimensional stabilization on a moisture equilibrium basis thus far obtained. The resulting ester is quite stable. Unlike other dimension-stabilizing treatments, the wood is not embrittled. It has other strength properties about the same as those of untreated wood. It is highly resistant to decay, termites and marine borers. The dimensional stability is primarily due to a bulking effect by the acetyl groups, which causes an increase in the dry dimensions without increasing the wet dimensions.

**PROPERTIES OF WATER-REPELLENT FABRICS.** J. W. Rowen and D. Gagliardi. *J. Research National Bureau Standards* 38, 103-17 (Jan. 1947). The theory of water repellency of textile fabrics is reviewed with special references to the more recent theories of the wetting of fabrics by water. A survey is made of the various testing methods that have been devised for measuring water repellency. The results of the present investigation lead to the following conclusions regarding the status of water repellency. There is a definite need for a comprehensive study of the role that the structure of a fabric plays in the phenomena of water repellency. In the past, the emphasis has been on developing more efficient compounds. Data available indicate that a better understanding of fabric construction as it applies to repellency, coupled with the now available water-repellent agents, will lead to some more nearly idealized type of water-repellent garment. In regard to testing methods, it is required that correlation be established between results of laboratory test methods and performance of fabrics in the rain. The contact angle is influenced by the following factors: the chemical nature of the solid surface, the porosity of the surface and the presence of other molecules on the surface. Again, any one or all of these factors could diminish the contact angle during wetting of the fabric. The changes in moisture regain rate increases in proportion to the number of times the sample has been wetted. It is of interest to examine the surface factors that might be

responsible for the increase in moisture absorption. The loss in repellent agent, the change in position of the fibers in the yarns and the creation of new surfaces could all affect the rate of water absorption. The swelling of partially coated or uncoated fibers would also result in making available more hydrophilic surfaces.

## Materials

**LOW POLYMERS OF CHLOROTRIFLUOROETHYLENE.** W. T. Miller, Jr., R. L. Ehrenfeld and M. Prober. *Ind. Eng. Chem.* 39, 333-7 (Mar. 1947). Highly stable chlorotrifluorocarbon polymer oils, greases and waxes were prepared from chlorotrifluoroethylene. This work was part of a program on the development of polymerization procedures for the preparation of fluorocarbon materials. Low polymers of chlorotrifluoroethylene in the desired range of molecular weight were prepared by solution polymerization with peroxide promotion. The solvent functioned as a chain transfer agent to control molecular weight while maintaining high monomer conversions. Final products were produced by treating appropriate fractions with cobalt trifluoride to fluorinate reactive end groupings introduced during the polymerization process. Thermal cracking of chlorotrifluoroethylene polymers was developed to increase the overall yield of oil and to recover monomer. The polymer oils were shown to be satisfactory lubricants. They exhibited greater change in viscosity with temperature than did petroleum oils but less than the perfluorocarbon oils available for comparison; solubility behavior was found to be normal.

## Applications

**OPTICAL PLASTIC MATERIALS.** D. Starkie. *British Plastics* 19, 96-103 (Mar. 1947). The properties of methyl methacrylate and polystyrene transparent plastics are reviewed with particular emphasis on optical properties. Methods for the manufacture of optical components from these materials are described. These include grinding and polishing, molding and casting. Applications described include television projection systems, railway signal lights, camera lenses, parabolic mirrors and binocular prisms.

**FREEZER WRAPS.** D. C. McCoy, S. V. Cook and G. A. Hayner. *Modern*

*Packaging* 20, 188-92 (Mar. 1947). Wrapping materials for frozen foods were investigated. Toxicity, odor, packaging manipulation problems, taste, strength at low temperature, ease of stripping and water vapor permeability are considered. The water vapor permeabilities of several paper and plastic film packaging sheet materials are reported.

**LAMINATED LABELS.** Modern *Packaging* 20, 168-9 (Mar. 1947). Bottle labels are made by printing in reverse on cellulose acetate film and laminating this film to paper. This tends to waterproof and stainproof the labels. The printing cannot be rubbed off and the finished label has a desirable gloss.

**PLASTICS IN LEATHERCLOTH.** L. Bilmes. *British Plastics* 19, 104-6 (Mar. 1947). The manufacture, properties and applications of fabrics coated with polyvinyl chloride plastics are described. The plastic may be applied to the fabric by calendering, by coating the fabric with a paste consisting of polyvinyl chloride, plasticizer, pigments and stabilizers and gelling the paste with heat, and by coating the fabric with an emulsion or latex which consists of fine particles of the plastic composition suspended in water. The outstanding properties are resistance to wear, abrasion, solvents, flexing, chemicals, weathering and burning. The product is used for upholstering furniture, handbags, shopping bags, luggage, footwear, belts, book binding and as a superior replacement for leather.

**METAL-TO-METAL ADHESIVES.** T. D. Perry. *Plastics (Chicago)* 6, 26, 28-9, 85-7 (Feb. 1947). A phenol-formaldehyde type adhesive for metal, wood and plastics is described. The method of preparing satisfactory bonds and the strength and durability properties of some of these joints are reported.

**TOOLS IN STYRENE BOXES.** *Modern Packaging* 20, 135 (Mar. 1947). Sets of mechanics tools are marketed in boxes molded of polystyrene.

## Coatings

**NEW GRAPHICAL METHOD OF FORMULATING OIL-MODIFIED ALKYD RESINS.** J. I. Lynas-Gray. *Paint Tech.* 11, No. 124, 129-40 (1946). Theories and graphic representations for formulating oil-modified resins are presented in this article.



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# U. S. Plastics Patents

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 10 cents each.

## VULCANIZABLE COMPOSITIONS.

G. F. D'Alelio (to General Electric Co.). U. S. 2,414,803, Jan. 28. A vulcanizable composition comprising the thermoplastic emulsion polymerizate of a mixture of styrene, ethyl acrylate and a derivative of butadiene-1,3.

CELLULOSE ESTERS. C. I. Haney and M. E. Martin (to Celanese Corp. of America). U. S. 2,414,869, Jan. 28. In the preparation of organic esters of cellulose having improved molding color where-in the ester is prepared by esterifying with an organic acid anhydride in the presence of an esterification catalyst and the ester is ripened to the desired acyl value, the step comprising filtering the solution of ripened cellulose ester, precipitating the ripened ester, drying and subjecting to extraction with an organic liquid having a solvent action on color-forming bodies and no solvent action on the cellulose ester.

POLYMERIZATION. P. W. Denny (to Imperial Chemical Industries Ltd.). U. S. 2,414,934, Jan. 28. Toluene-soluble polyvinyl chloride of improved color stability is prepared by dispersing vinyl chloride in an aqueous medium containing formaldehyde and a peroxide catalyst and heating under pressure.

CELLULOSE DERIVATIVE. J. B. Rust (to Montclair Research Corp.). U. S. 2,415,039-40, 1, 2, 3, 4. Jan. 28. Cellulose products soluble in dilute aqueous alkalies consisting of acid-coagulated, washed and dried reaction products of alkali cellulose with an  $\alpha,\beta$ -unsaturated aldehyde an  $\alpha,\beta$ -unsaturated ketone, an unsaturated ether, an  $\alpha,\beta$ -unsaturated nitrile, a substituted carbodiimide and an unsaturated polycarboxylic acid.

POLYVINYL CHLORIDE TREATMENT. M. T. Harvey (to Harvel Research Corp.). U. S. 2,415,096, Feb. 4. The method comprising heating above 140° F. a normally liquid unsaturated organic product capable of dissolving solid polyvinyl chloride at elevated temperatures, which solution on cooling is a gel at 70° F., agitating the liquid in the presence of a free oxygen containing gas until the viscosity of the mass at 25° C. has increased 50 percent, said liquid being an organic reaction product of formaldehyde and a terpene or terpene alcohol in presence of an acidic condensing agent.

AIRPLANE CLUTCH DISKS. M. Hasimoto (to Alien Property Custodian). U. S. 2,415,097, Feb. 4. The

method of forming a clutch disk comprising roughening the faces of a steel plate, coating the surfaces with phthalic anhydride resin, forming sheets of soft asbestos paper impregnated with phenolic resin having ammonia as its catalyzer, applying the sheets to the coated surfaces of the plate, providing friction plates of asbestos impregnated with phenolic resin having caustic soda as catalyst, placing the friction plates over the sheets, fastening the parts together, finally subjecting them to heat and pressure causing them to adhere.

POLYAMIDE SOLUTIONS. A. O. Rogers (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,415,193, Feb. 4. A composition comprising a solution of a synthetic linear polyamide in a normally liquid monohydroxy organic cyanide, said polyamide comprising the reaction product of a linear polymer-forming composition consisting of monoaminomonocarboxylic acids or mixtures of diamine with dibasic carboxylic acid.

VINYL RESIN. G. W. Whitehead (to Monsanto Chemical Co.). U. S. 2,415,319, Feb. 4. A polyvinyl acetal resin pressure molding composition having decreased mold stickage, containing a physical mixture of water-insoluble polyvinyl acetaldehyde acetal resin and 1 to 30 parts for every 100 parts of resin of a monohydroxy carboxylic acid having at least two carbon atoms.

FABRIC TREATMENT. C. M. Whittaker, H. A. Thomas, C. C. Wilcock and C. P. Tattersfield (to Courtaulds Ltd.). U. S. 2,415,320, Feb. 4. Differential dyeing effects are obtained on cellulosic fabrics by uniformly impregnating with a liquid composition containing nitrogenous resin-forming compounds, evaporating the liquid such that evaporation is more rapid from predetermined portions than from remaining portions.

CASHEW NUT SHELL LIQUID. E. H. Freund and P. Mahler (to General Foods Corp.). U. S. 2,415,347, Feb. 4. A water-soluble compound is prepared by adding sulfuric acid to the condensation product of a distillate of cashew nut shell liquid and formaldehyde and mixing with a high molecular weight unsaturated fatty acid while maintaining the temperature at not more than 30° C.

PLASTIC CUPS. A. F. Pityo. U. S. 2,415,370, Feb. 4. The method of producing a tapered cup to hold hot material comprising making a blank from a layer of

fibrous absorbent material impregnated with a thermosetting plastic material, forming and curing.

## HYDROPHILIC COLOR FORMERS.

D. W. Woodward (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,415,381-2, Feb. 4. A photographic element comprising a support having a light-sensitive layer comprising a hydrophilic ether of a hydrolyzed aliphatic monoolefin-vinyl ester interpolymer having dye intermediate nuclei attached through ether linkages to chain atoms of interpolymer.

COPOLYMER. R. T. Armstrong (to U. S. Rubber Co.). U. S. 2,415,400, Feb. 11. An interpolymerizate of maleic anhydride and a methallyl alkyl ether in which said reactants are combined in equimolecular proportions.

LAMINATED PAPER. G. C. Borden and W. Herrick (to Riegel Paper Corp.). U. S. 2,415,551, Feb. 11. Laminated greaseproof paper having a laminating composition comprising a resin-plasticizer blend containing precipitated normally solid fluxing material therein, said composition being thinly fluid at temperatures above its melting point.

FIBER TREATMENT. G. S. Radford and I. S. Hurd (to Rohm and Haas Co.). U. S. 2,415,564, Feb. 11. Cardable, resilient, non-embrittled, staple regenerated cellulose fibers are prepared by impregnating at temperatures from 30 to 100° F. staple regenerated cellulose fibers in bulk under sustained fluid pressure with an aqueous solution of aldehyde-condensation resin-forming components and a latent catalyst for a period of time sufficient to cause thorough impregnation, removing by hydroextraction the resin on the surface of the fibers, rapidly drying the resulting fibers, and finally heating dried fibers to effect reaction and insolubilizing of resin-forming components.

PHOTOGRAPHIC PAPER. H. T. Galley (to Eastman Kodak Co.). U. S. 2,415,631, Feb. 11. A photographic paper comprising a paper coated on one side with baryta, waterproofed by applying to both sides a melt coating consisting of a butyric acid ester of cellulose and a plasticizer, and a coating of silver halide emulsion applied over the melt coating on the side previously coated with baryta.

COPOLYMERS. W. O. Kenyon and T. F. Murray, Jr. (to Eastman Kodak Co.). U. S. 2,415,638, Feb. 11. A resi-

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nous material is obtained by copolymerizing a mixture of methyl isopropenyl ketone and 2-methyl-4-methylene-1,3-dioxolane.

**LAMINATE.** P. P. Ryan (to St. Regis Paper Co.). U. S. 2,415,763, Feb. 11. A hard, rigid, non-deformable resinous laminate capable of withstanding temperatures above 300° F. and of receiving a baked-on enamel coating without blistering, comprising a multiplicity of thermosetting resin impregnated sheets of fibrous material united under the combined action of heat and pressure, one surface sheet having a high resin content and the opposite surface sheet having a low resin content to allow for the escape of gases generated during the curing operation.

**CRYSTALLIZING COATING.** W. A. Waldie (to Chemical Developments Corp.). U. S. 2,415,775, Feb. 11. A coating composition comprising a crystallizing solution consisting of a crystallizing substance such as acetanilide, phthalic acid, salicylic acid, or saliformin, solvent and chlorinated rubber.

**POLYMER.** J. G. Lichty (to Wingfoot Corp.). U. S. 2,415,796, Feb. 11. Polymer of  $\alpha,\beta$ -dichloroacrylophenone.

**COMPOSITE.** A. M. Neal and J. J. Verbanc (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,415,839, Feb. 18. Vulcanized rubber articles reinforced with a fibrous structure bonded to said rubber by means of a compound such as a polyisocyanate, a polyisothiocyanate or mixtures thereof.

**ADHESIVE TAPE.** W. L. Nelson and W. N. Morris (to Johnson & Johnson). U. S. 2,415,901, Feb. 18. In an adhesive tape, a pressure-sensitive mass comprising a mixture of polyvinyl *n*-butyl ether and factice.

**COLLAPSIBLE TUBE.** R. E. Paige. U. S. 2,415,906, Feb. 18. A collapsible dispensing tube comprising a tube body and a rigid head member, said portions being secured by means of an inner plastic ring interposed between and secured adhesively to adjacent surfaces.

**MOLDING.** L. Nast. U. S. 2,415,961, Feb. 18. A multiple section mold for pressure molding plastic objects.

**WELT INSOLE.** W. C. Wright (to Wright-Batchelder Corp.). U. S. 2,415,982, Feb. 18. A welt insole comprising an insole blank and a molded upstanding sewing rib formed with a bottom flange, said flange being adhesively secured to the marginal surface of the blank; said rib and flange comprising a preformed continuous unscarfed mass of interlaced fibrous layers impregnated with a permanently plastic binder.

**FURFURYL ALCOHOL RESINS.** W. H. Adams, Jr. (to Hoveg Corp.). U. S. 2,416,038, Feb. 18. The step in

the preparation of an initial, fusible, soluble furfuryl alcohol resinous condensate comprising adding to furfuryl alcohol a solution of an active acid catalyst in furfural, the furfural not exceeding 15 percent of the weight of the furfuryl alcohol.

**COATED FABRIC.** P. R. Austin (to E. I. du Pont de Nemours and Co., Inc.). U. S. 2,416,041, Feb. 18. An article comprising a flexible fabric carrying a nitrocellulose-containing coating and in exterior adherence thereto, a topcoat comprising an alcohol-water soluble synthetic linear polyamide obtained by interpolymerization product of hexamethylenediammonium adipate and 6-aminocaproic acid.

**CURING OF OLEFIN POLYMERS.** A. McAlevy, D. E. Strain and F. S. Chance, Jr. (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,416,061, Feb. 18. A rubberlike composition comprising a mixture cured by heating between 60 and 300° C., said mixture containing a polymer of a monoolefinic hydrocarbon such as ethylene, propylene or isobutylene; a salt-forming substituent other than halogen and a substituent such as a halogen, hydrocarbon or an acyloxy group; and a polyvalent metal oxide or hydroxide.

**HALOGENATED POLYETHYLENE.** S. Le R. Scott (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,416,069, Feb. 18. Chlorinated polymers of ethylene are modified by compounding with sulfur, a vulcanizing accelerator, and a group II metal oxide and heating the intimate mixture to between 100 and 165° C. for at least 15 minutes.

**INSULATING MATERIAL.** L. J. Berberich (to Westinghouse Electric Corp.). U. S. 2,416,143, Feb. 18. Laminated electrically insulating material comprising mica flakes and a bonding agent comprising the reaction product of styrene and the half ester of maleic anhydride and castor oil, the laminated material can withstand high temperatures without flowing and has a low power factor at that temperature.

**TEXTILE TREATMENT.** J. Boulton (to Courtaulds Ltd.). U. S. 2,416,151, Feb. 18. An improved process for imparting crease-resisting properties to cellulosic textile materials comprising mixing two solutions, one containing a mixture of urea and formaldehyde and the other an acid catalyst comprising a mixture of boric acid and an aliphatic carboxylic acid such as lactic or tartaric acid; mixing said solutions; immediately impregnating the textile material; and thereafter subjecting the treated fabric to the action of heat so as to convert the resin forming solids to the insoluble, infusible state.

**ABRASIVE.** S. S. Kistler (to Norton Co.). U. S. 2,416,182, Feb. 18. A bonded abrasive article is prepared by

intermixing polyvinyl butyral with a polymerizable amine-bearing resin compound such as aniline-formaldehyde, melamine-formaldehyde, urea-formaldehyde, or a phenol-formaldehyde condensate containing an amino group; incorporating abrasive grains therein with the aid of an alkylating plasticizing agent such as a symmetrical polyglycol dihalide or a glycolhalogen acetate; shaping an article from the mixture; and thereafter heating to polymerize the resin and form a cured, bonded abrasive body.

**STATIC ELIMINATION.** E. J. Naumann (to Westinghouse Electric Corp.). U. S. 2,416,202, Feb. 18. A transparent resinous member subject to the accumulation of electrical charges and means for dissipating said charges whereby the accumulation of charged dust particles thereon is prevented.

**PLASTIC SUBSTANCES.** O. M. Reiff (to Socony-Vacuum Oil Co.). U. S. 2,416,218-9, Feb. 18. A resilient composition formed by heating chlorinated petroleum wax with a phenol modified with a nuclear hydrogen, hydroxy, alkyl, aryl, aralkyl or alkoxy group in the presence of a Friedel-Crafts catalyst to produce a condensate and thereafter heating with hexamethylenetetramine or sulfur monochloride to cure condensate.

**FUEL CELL.** W. C. Smith and J. P. Haworth (to Standard Oil Development Co.). U. S. 2,416,231, Feb. 18. A fuel cell comprising a number of laminae; one being an inner layer of elastic gasoline-resistant material, another being an outer layer of elastic, oil-resistant, abrasion-resistant material and an interposed layer comprising a cured polymer of isobutylene with a diolefin containing therein a purified paraffinic hydrocarbon oil.

**AROMATIC AMINE POLYMER.** S. S. Kistler (to Norton Co.). U. S. 2,416,262, Feb. 18. A halogenated cross linked aromatic amine polymer comprising a condensate of one molecular proportion of primary aromatic amine such as aniline, *m*-phenylene-diamine, *m*-toluidine, or diaminodiphenylmethane and at least one molecular proportion of aldehyde such as formaldehyde or furfural, condensed in the presence of an acid, said resin being cured by heating with an aliphatic halohydrin.

**POLYMER STABILIZATION.** B. S. Biggs (to Bell Telephone Laboratories, Inc.). U. S. 2,416,282, Feb. 25. An elastomer produced by curing with benzoyl peroxide a glycol-dicarboxylic acid polyester, the intramolecular ester chains of which are linear and are made up of divalent hydrocarbon radicals joined by ester linkages, the molecules of said polyester containing an average of less than five olefinic bonds per 400 atoms in the linear ester chains, calculated by assuming no cross linking between molecules at unsaturated bonds, said polyester containing

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no additional non-benzenoid unsaturation, the number of ester groups in said polyester constituting at least 98 percent of the total number of ester, hydroxy and carboxyl groups, said cured polymer being stabilized by heating under a high vacuum above about 125° C. for a time sufficient to increase resistance to hydrolysis.

**MOLDING.** W. S. Renier. U. S. 2,416,348-9, Feb. 25. A device for molding plastic material.

**DYE STABILIZATION.** B. Collie, C. H. Giles and D. G. Wilkinson (to Imperial Chemical Industries, Ltd.). U. S. 2,416,380, Feb. 25. The resistance to fume fading of dyes used in the coloring of cellulose esters or ethers is improved by incorporating therein N,N'-diphenylethylenediamine.

**RESIN.** C. F. Brown (to U. S. Rubber Co.). U. S. 2,416,433, Feb. 25. A resinous composition comprising the heat reaction product in the range between 180 and 300° C. of a mixture of rosin, triethanolamine, ethylene glycol, a dimerized soybean oil fatty acid and a polyvinyl acetal resin.

**POLYMERS.** W. J. Burke (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,416,434, Feb. 25. A polymeric product comprising a rubberlike polymer modified by the attachment thereto of ether, thioether or amido groupings.

**POLYMERS.** C. F. Fryling (to B. F. Goodrich Co.). U. S. 2,416,440, Feb. 25. The method comprising polymerizing in aqueous emulsion a mixture of butadiene-1,3 and an unsaturated compound copolymerizable therewith in aqueous emulsion in the presence of bis-isopropyl xanthogen and cetyl mercaptan.

**MOLDING.** F. H. Magnus (to International Plastic Harmonica). U. S. 2,416,451, Feb. 25. Method and device for molding integral reed plates from plastics.

**POLYMERS.** L. F. Salisburh (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,416,456, Feb. 25. A synthetic rubberlike material comprising a copolymer of fluorobutadiene obtained by copolymerizing 2-fluoro-1,3-butadiene, its methyl, ethyl, or propyl homologs with styrene.

**CLOSURE.** J. Samuelson. U. S. 2,415,457, Feb. 25. A handbag containing structural, decorative plastic portions.

**RESINOUS MATERIAL.** E. A. Lasher (to California Flaxseed Products Co.). U. S. 2,416,485, Feb. 25. A resin consisting of an acid inter-esterification product of a hydroxylated oil, a hydroxy polybasic aliphatic acid and a hydroxy monobasic aliphatic acid.

**LIGHT-POLARIZING IMAGES.** F. J. Binda (to Polaroid Corp.). U. S. 2,416,510, Feb. 25. An image-carrying

element adapted to have images, designs, etc., formed therein and having an outer layer possessing the property of absorbing and orienting dichroic dyes and stains used in the production of light-polarizing images, comprising in combination a flexible support formed of a sheet of cellulose acetate and, structurally integral therewith, at least two layers of polyvinyl alcohol positioned in superimposed relation to each other on at least one surface of the support, the outermost layer of said polyvinyl alcohol having its molecules oriented in parallelism whereby light polarizing images in terms of dichroic dyes and stains may be formed.

**DECORATING.** H. Freiberg (one half to Samuel Freiberg). U. S. 2,416,521, Feb. 25. A fibrous material having surface decoration comprising reticulated material secured to the surface thereof by means of decorative hardened self-adherent and upstanding globules of synthetic resin.

**COPOLYMERS.** H. T. Neher and C. F. Woodward (to Rohm and Haas Co.). U. S. 2,415,536, Feb. 25. A copolymer consisting of acrylic acid, its esters, amides, or nitrile and 5 to 50 percent acrolein.

**DRY BATTERY.** A. O. Frantz, J. M. Martinez and M. D. Koppelman (to Olin Industries, Inc.). U. S. 2,416,576, Feb. 25. A primary battery comprising groups of flat cell elements and a substantially rigid tray for each group, trays formed of a thermoplastic dielectric material.

**TEXTILE DECORATING.** D. M. Gans and J. R. Abrams (to Interchemical Corp.). U. S. 2,416,620, Feb. 25. A textile decorating composition of plastic composition such that it can be applied to cloth, said composition comprising a heat-convertible synthetic resin and a solvent therefor, the resin being catalytically and non-uniformly advanced so that a part is gelled while part remains ungelled, thus producing a vehicle of marked yield value and variable flow.

**POWDER.** D. E. Pearsall (to Ensign-Bickford Co.). U. S. 2,416,639, Feb. 25. A slow burning powder composition, comprising polyvinyl alcohol, oxidizing agent.

**ARTIFICIAL BOARD.** C. A. Upson (to Upson Co.). U. S. 2,416,721, Mar. 4. A web of sheet material coated with heat-curing resin is prepared by advancing the coated web continuously and subjecting it, while advancing, to the action of heat and progressively increasing pressure acting against the coated surface in sliding relationship thereto, thus ironing surface.

**VINYL INTERPOLYMERS.** B. W. Hawk and J. H. Richter (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,416,874, Mar. 4. Vulcanized insoluble interpolymers of vinyl chloride with diethyl fumarate are prepared by heating said interpoly-

mers at 130 to 150° C. for 50 to 60 min. with 0.25 to 10 percent of sulfur, 3 to 5 percent of zinc oxide and 0.25 to 5 percent of mercaptobenzothiazole.

**HALOGEN LINEAR POLYMERS.** R. V. Lindsey, Jr. and S. Le R. Scott (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,416,878, Mar. 4. An essentially saturated interpolymer of vinyl chloride and ethylene is prepared by milling with a metal oxide of Group II and a thiuram tetrasulfide and heating for 15 min. at 100 to 150° C.

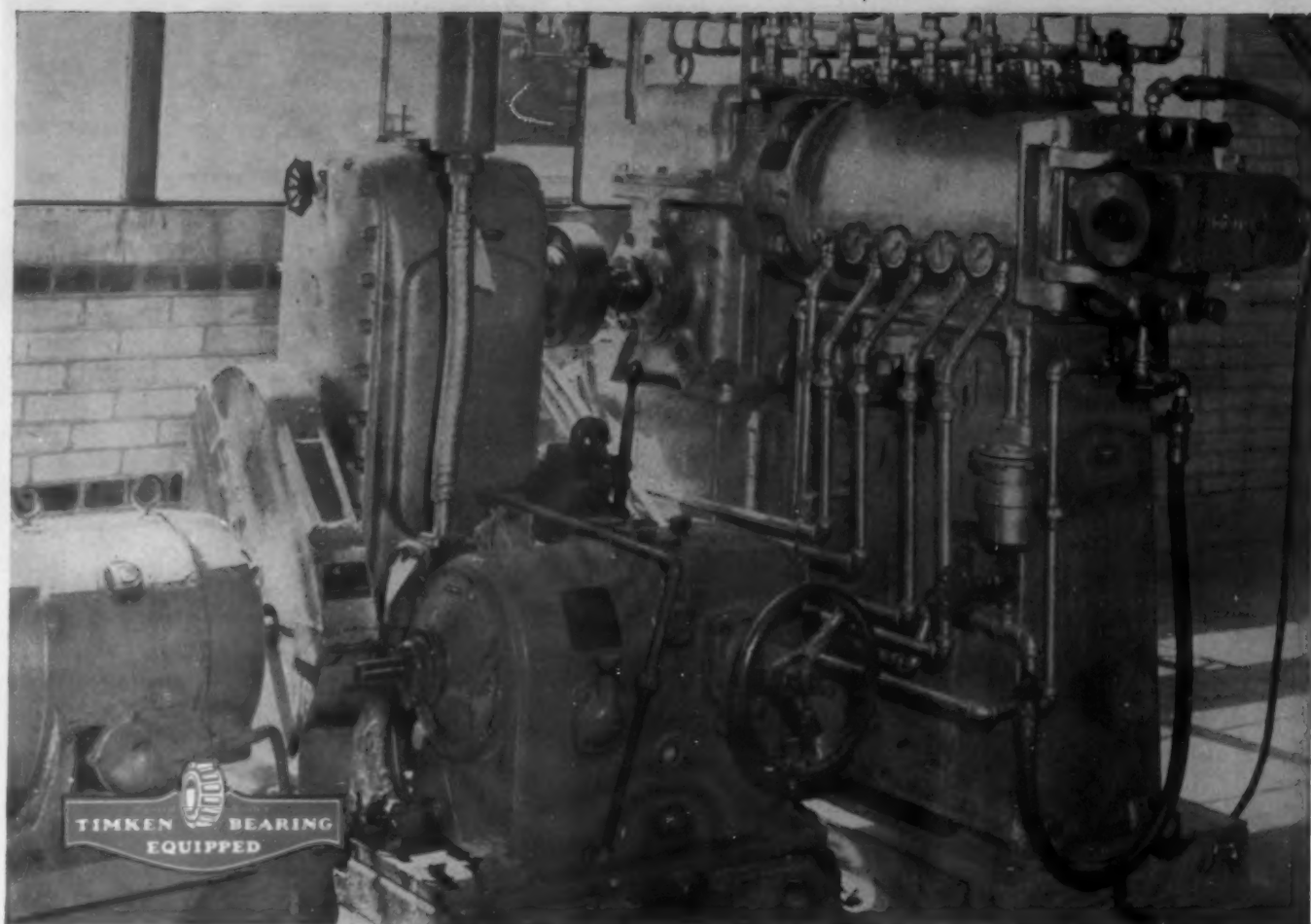
**POLYVINYL ALCOHOL.** C. W. Mortensen (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,416,880, Mar. 4. A reaction product of polyvinyl alcohol containing at least three hydroxyl groups per mol and from 2 to 20 percent of an alpha polychlorinated macromolecular linear polymeric ether.

**FIBERS AND FOILS.** J. Amende and W. Ender (to Attorney General of the U. S.). U. S. 2,416,890, Mar. 4. A process for the manufacture of fibers and foils from a mixture of an alkali-soluble linear superpolyamide containing sulfamide groups and a cellulosic solution such as viscose, or ammoniacal copper oxide cellulose, comprising adding to the cellulosic solution an alkaline solution of the superpolyamide, forming fibers and foils from the resulting solution and coagulating in a suitable bath.

**RESIN HYDROGENATION.** W. H. Carmody (to Carmody Research Laboratories, Inc.). U. S. 2,416,901-5, Mar. 4. Resins such as pinene or coumarone-indene resins are hydrogenated by contacting with hydrogen in the presence of a metal chromite catalyst such as copper chromite, iron chromite, or nickel chromite; black copper oxide; or Raney nickel catalyst; under pressure not above 2100 p.s.i., between 90 and 225° C.

**ADHESIVE TAPE.** M. H. Kemp (to Kendall Co.). U. S. 2,416,925-6, Mar. 4. A surgical tape comprising a flexible backing coated on one side with a tacky pressure sensitive adhesive consisting of crude rubber, filler, a plasticizer and a resin; at least one half of the latter being treated rosin (Poly-pale resin).

**COLLAPSIBLE TUBES.** E. Stather-Dunn and F. M. Menheneott (to Betts & Co., Ltd.). U. S. 2,416,962, Mar. 4. Seamless collapsible tubing is prepared by temporarily attaching a preformed shoulder and nozzle to one end of a mandrel having a hard smooth surface, covering the mandrel surface with a thin lubricant film which is incompatible with the plastic to be used, thereafter forming upon the coated mandrel surface and the preformed shoulder only one coat of a plastic material in the fluid state, allowing said material to solidify, releasing said attaching means, sliding mandrel from tube thus formed.

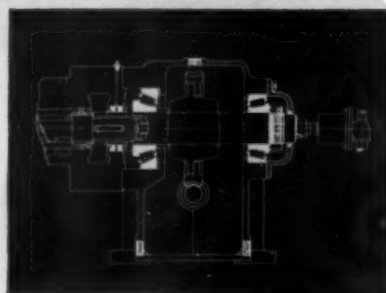


## Canadian Resins And Chemicals Ltd. Operates TIMKEN BEARING Equipped Extruders

The 3 3/4" plastics extruder shown in the photograph is installed in the development laboratory of Canadian Resins and Chemicals Limited, Shawinigan Falls, Quebec. Like the mills and calenders used in this modern plant, the extruders were designed and built by Dominion Engineering Works Limited, Montreal, Canada and are equipped with Timken Tapered Roller Bearings to assure smooth, economical operation; increase production; improve product quality; reduce maintenance.



The bearings are mounted on the screw drive shaft carrying the cone gear as shown in the drawing. The principal function of the larger bearing is to carry the severe thrust load arising from the pressure created by the feed screw. The other bearing carries mostly radial load and some thrust. Both bearings combine to hold the shaft in correct and constant alignment; eliminate friction; prevent shaft wear; and simplify lubrication.

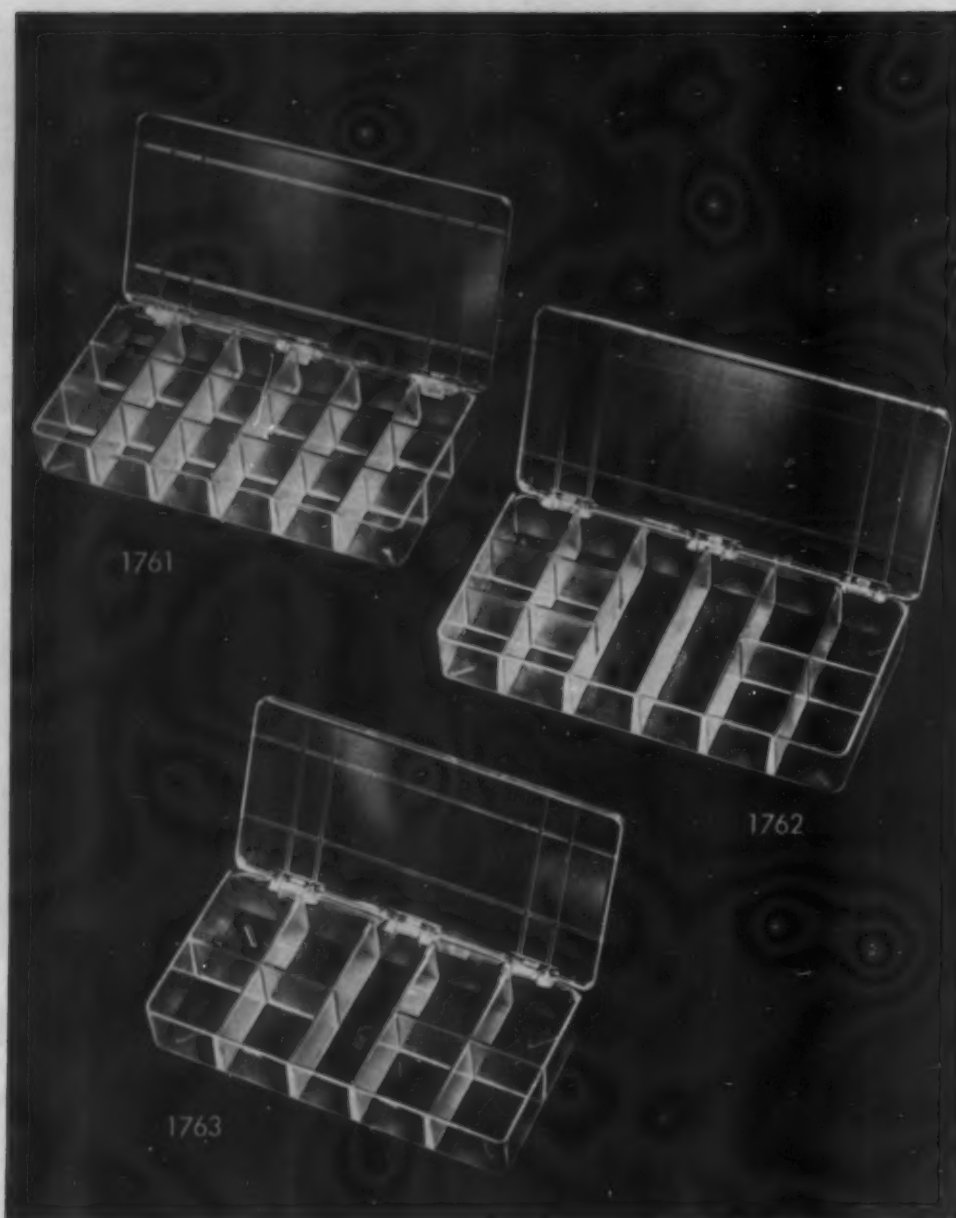
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*Application of Timken Bearings  
in extruder at Canadian Resins  
And Chemicals Limited.*



NOT JUST A BALL  NOT JUST A ROLLER  THE TIMKEN TAPERED ROLLER  BEARING TAKES RADIAL  AND THRUST  LOADS OR ANY COMBINATION 



## Plastics Stock Molds

### SHEET ONE HUNDRED FIFTY-ONE

Handy utility boxes are a household and store aid. Transparency for identification and partitions for assortment heighten their helpfulness. They may be used to hold small hardware, sewing paraphernalia, fishing tackle, etc.

1761. Utility box having 18 compartments, all the same size. Overall dimensions are:  $8\frac{1}{4}$  in. long by  $4\frac{1}{4}$  in. wide by  $1\frac{1}{4}$  in. deep.

1762. Box having 12 compartments in 3 different sizes. Overall dimensions same as No. 1761.

\* Reg. U. S. Patent Office

1763. Box having 9 compartments in 2 different sizes. Same overall dimensions as No. 1761. When used for display purposes, velvet pads may be fitted into bottom of compartments.

*The names and addresses of the manufacturer who makes these stock molds, are listed on page 161.*



*Beauty for all time —* **STYRON!**

BEAUTY HAS BROUGHT fine plastics an enthusiastic acceptance in the homes of America. And in the realm of beauty, few, if any, materials exceed the jewel-like brilliance of Styron, with its unlimited range of color and clarity. ◊ Scores of new and old products are being made of Styron now, in numbers as large as expanded production will permit and in variety as wide as the reach of a designer's imagination. For low cost Styron has become a great name in plastics. It brings to the field of plastics that basic kind of value that places *better* things within the reach of *more* people. ◊ Styron is just one Dow plastic, and plastics are just one part of Dow's production of useful chemical products.

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**DOW**  
*Plastics*

*50th Anniversary 1897-1947*

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in resin monomer  
SAFETY IN HANDLING  
due to shock insensitivity  
EVEN DECOMPOSITION RATE  
during polymerization  
HIGH CATALYTIC ACTIVITY  
HIGH THERMAL STABILITY

THESE valuable properties of Uniperox 60 make this new liquid hydroperoxide an outstanding catalyst for unsaturated polyester resins. The even cure rate aids in attainment of desired degree of polymerization... reduces thermal strains in castings. The safety features greatly diminish manufacturing hazards.

We solicit your inquiries. Data on Uniperox 60 will be sent promptly on request.

**R. T. COLLIER  
CORPORATION**

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*Any desired pattern of decoration can be achieved by electroplating acrylic eyeglass frames with silver and gold*

## Plated eyeglasses

STYLING eyeglasses to suit individual tastes and wardrobes is accomplished by G. M. C. Process Corp., 46 Great Jones St., New York City, through the decorating of Plexiglas frames with silver and gold plate. The frames, fabricated in 14 stock colors and many more different styles by Lu-Optic Mfg. Co. Brooklyn, N. Y., offer a great variety to the processor whose decorating patterns are limited only by imagination.

In applying a silver design, a thin coat of fine silver solution is first hand painted on the frames. This solution bites into the plastic surface to an infinitesimal depth which is enough to give succeeding metal coats a firm base and prevent the metal from chipping off. Transferring the frames to the electroplating baths, they are suspended in a chemical solution which activates the plating anodes. By hanging the frames from copper wires that are tied to crossbars at the top of the tank, it is possible to electroplate several hundred frames at once.

The number of plating baths necessary and the amount of time the frames must spend in the baths are determined by the thickness of the metallic coating desired. On the average the electroplating process consumes from 5 to 7 hr. and a coating of  $7/1000$  to  $20/1000$  in. thick is applied. The problem of keeping metal hinges from being electroplated, while the frames are in the baths, is licked by coating them with a stop-off such as sealing wax or shellac.

Some very attractive effects can be achieved by etching a secondary design in the silver plate. Any acid that eats into the silver can be used, and it need only penetrate enough to roughen the surface. As the last finishing process, metal parts are buffed and lacquered.

Gold plating is done in the identical manner as silver except that G. M. C. substitutes 24-carat gold plating.

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Metal Plating



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There is capacity at Hardy for speedy production on any scale, with a battery of over 50 injection molding presses ranging in size from 8-24 ounces... your guarantee of steady, uninterrupted, economical processing. A model or blueprint will bring you prompt quotations on molds and molding costs. Inquiries invited!

Illustrated: "Little" Ambassador Model 701, a product of Tele-tone Radio Company, New York City.

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**VULCANIZED FIBRE**—Remarkably uniform, high-grade, hard fibre in sheets 56 x 90 inches to save waste in cutting. Smaller sheets if desired. Also in standard-size rods.

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General purpose phenolic was selected for the housing of this massager, specifically designed for use in home

## Phenolic massager

**H** EAT AND massage—two of nature's oldest remedies are combined in a new therapeutic electrical appliance, the Roll a Ray, manufactured by O. A. Sutton Corp., Beacon Bldg., Wichita, Kans. Made specifically for use in the home, the massager which is housed in phenolic, offers soothing relief to discomforts arising from muscular aches, rheumatism, lumbago and physical aches. The massager is also recommended for use as a home reducing unit.

One of the first considerations in the designing of this massager was the selection of a proper material for the housing. General-purpose phenolic was selected for a number of reasons.

As the appliance was to be used on the bare skin, the company wished to avoid a cold clammy feeling upon contact. Here plastic was, of course, much more suitable, for it has a warmer feeling than any metal. Then, too, plastic was chosen because of its adaptability in forming, its light weight and its smooth surface which proved very receptive to the finishing coat.

The final result was a massager weighing 32 oz. and measuring 8 in. in length, 6½ in. in height and 4½ in. in width.

### Seven parts to housing

There are seven parts to the phenolic housing—the base, the curved top section, handle and four small

slugs. A 2-cavity compression mold is used to form both the bottom and top sections.

The slugs are an interesting feature. Six screw holes are molded in the base for attachment to the top phenolic piece. In addition, four grooves are molded in so that in assembling, the rubber rollers can be slid into position. The slugs are then slipped into the grooves locking the rollers in place. When the base and top section are screwed together, the ends of the slugs rest against molded-in steps in top section.

As can be seen in the illustration below showing the massager before it is assembled, a grill is also an integral part of the bottom section. This strengthens the piece, serves to hold the infrared lamp at the proper distance and prevents the user from burning himself through accidentally touching the lamp.

The top section of the housing has six molded-in screw holes for attachment to the base and two more for attachment to the handle. This handle is produced in a 2-cavity transfer mold.

#### Cooled in steel fixture

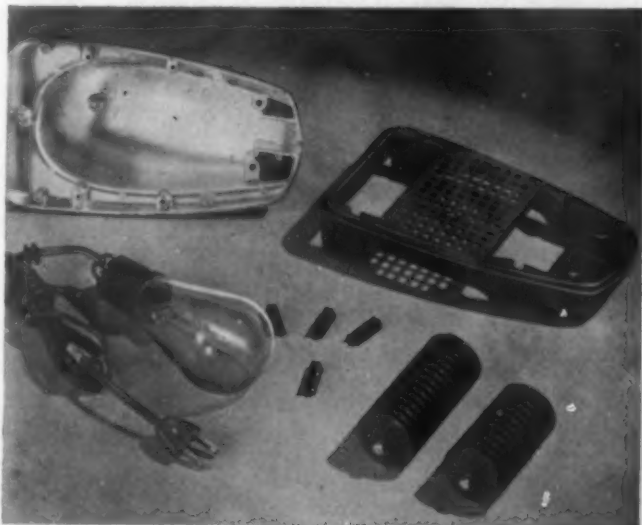
In making the moldings for the Roll a Ray, the molder was confronted with the special problem of obtaining exchangeability of the component parts and yet obtaining a perfect fit in all cases. To prevent shrinking and to attain a uniform size, the component parts are cooled in a steel fixture after molding.

The only finishing required is the painting in of the name in white and the spraying on of a silver coat inside the top section to give better reflective qualities to the lamp. Silver finish is dried in infrared light drying unit.

#### Non-plastic parts

Non-plastic components include the infrared lamp, rubber rollers, socket and cord. The rollers are composed of a series of rubber disks to provide gentle massage. They are given a smooth finish and offer the right amount of resistance to afford proper massage effect.

*Unassembled massager shows six of seven plastic parts, rubber rollers and infrared unit. Handle is not shown*



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● **ENGINEERING RECOMMENDATIONS.** Let Hannifin engineers help you get the BEST solution for your hydraulic cylinder problems. See your local Hannifin representative, or write,



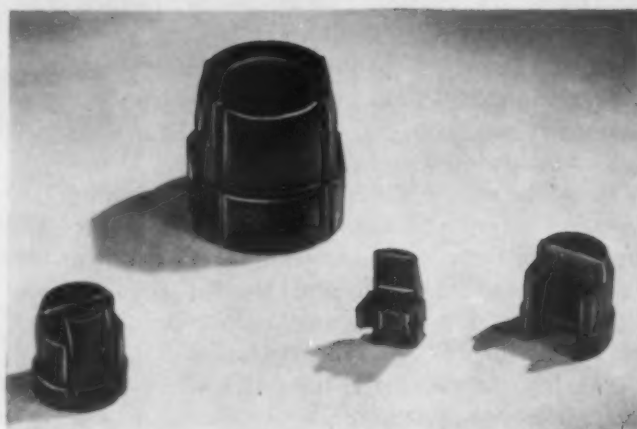
This sectional view shows the patented construction of Hannifin double acting Hydraulic Cylinders. Note the simple, compact, and rugged construction . . . long bearing surfaces . . . full 4-ring piston construction.

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PNEUMATIC PRESSES • HYDRAULIC RIVETERS • AIR CONTROL VALVES

## New uses



1—This two-piece nylon grommet insulates lead-in wires on electrical applications, keeps them from wearing

**N**YLON, familiar to the consumer as stockings, is now becoming better and better known in the industrial field in its molded form. The toughness of the material, its form stability and the ease with which it can be molded into small precise shapes are characteristics aiding its adoption for industrial use.

### A nylon grommet

All of these characteristics were considered of importance in the manufacture of a vise-like grommet which serves a dual function of insulation and strain relief on an electrical wire at the place where the wire emerges from appliances such as clocks, radios, fans, lamps, etc.

A product of Heyman Mfg. Co., Kenilworth, N. J., the grommet is molded by Mack Molding Co., Inc., Wayne, N. J., of black nylon (Fig. 1). It consists of two interlocking pieces which, after insertion of the appliance wire, are easily snapped together and into the aperture in the appliance chassis where the grommet grips the wire firmly. Thereafter, the push and pull on the wire is absorbed by the bushing, and no fraying will result. The insulation properties of the grommet prevent the lead-in wire from being grounded by the chassis or case of the appliance.

In tests made by the manufacturer, the grommet withstood a temperature of 400° F.—a figure which far exceeds the 212° F. requirement which must be met in order to pass the heat and insulation tests set forth by the electrical underwriters association.

Several stock sizes of the grommet make it suitable for application on most standard appliances.

### Conveyor belt combines plastic and rubber

Taking advantage of the strength properties of nylon, the United States Rubber Co., Rockefeller Center, New York City, has combined this plastic with

# for NYLON

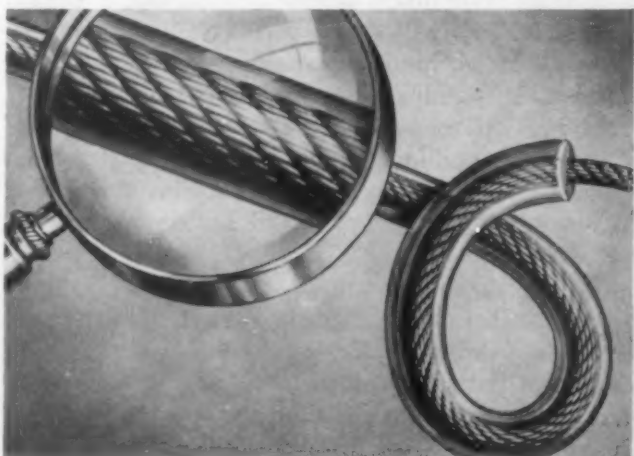


2—Belts of nylon and fabric are credited with 200 to 400 percent more strength than rubber-fabric belts



3 (Above)—Fourteen nylon parts comprise rate gyro used in planes as lateral and horizontal stability instruments

4 (Below)—A good appearance makes this nylon covered cable suitable for home as well as for industrial use



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"KLEER-MARK" HOT STAMPING

KNOBS—ALL TYPES—In Stock  
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Chicago 41, Illinois

*too hot!*



In molding plastics, too high a temperature in the molds may cause off colors, brittleness and warpage. On the other hand, too low a temperature often results in soft centers and low tensile strength. The routine use of the Cambridge Mold Pyrometer will go a long way in avoiding the spoilage caused by off temperature molds. This accurate, rugged instrument instantly indicates the surface temperature of mold cavities so that the operator can control it. Needle and Roll Model Pyrometers also available. Send for Bulletin.



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*Plastic Colors?*

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**Color Division**

**FERRO ENAMEL CORPORATION**

4150 East 56 Street



Cleveland 5, Ohio

its Ustex material to produce a conveyor belt that has 250 to 400 percent more strength than other rubber-fabric belts (Fig. 2, page 149).

The belt is specially designed for use in mines, quarries and large dam construction projects where it can be used to convey iron ore, coal and a variety of bulky materials. The increased strength obtained by combining the nylon with the rubber in this textile belt multiplies the working tension of each ply by two and one-half times and permits the use of more fabric plies.

In addition to greater strength, the belt has the advantages of low stretch lengthwise and increased flexibility crosswise. Because the material does not stretch it can be used in much longer strips than was formerly possible and flexibility gives better troughing qualities.

Transportation by conveyor belt is becoming increasingly popular and it is entirely possible that in the future this belt will be used to carry construction materials, packaged products and even fruits across great stretches. Future uses for the Ustex-nylon textile, aside from the conveyor belt, include reinforcements for rubber hose and rubber products.

#### A hard-wearing cable

Danco nylon cable (Fig. 4) brought on the market by Danielson Mfg. Co. of Danielson, Conn., is the product resulting from extended laboratory research by E. I. du Pont de Nemours & Co., Inc., in the extruding of nylon. It has been made to withstand 320,000 flexings before its steel core breaks and 410,000 flexings before the nylon itself severs. Besides its exceptional qualities of fatigue and abrasion resistance, the cable will not fray, rust or rot and will resist moisture, salt water and fire. It has an attractive silk-smooth surface and therefore can be used in the home where a quality of beauty is often necessary.

This cable is presently made in two sizes— $\frac{6}{32}$  in. o.d. and  $\frac{7}{32}$  in. o.d.—and has already been put to use in the industrial and transportation fields.

#### A 14-part rate gyro

The use of nylon in fine machine design is well illustrated by a rate gyro being molded of nylon by Arnold Brillhart, Old Country Road, Mineola, N. Y., and Atlantic Plastics, Inc., 131-32 40th Rd., Flushing, N. Y., for Fairchild Camera & Instrument Corp., Jamaica, N. Y. (Fig. 3). Its 14 parts include coil bobbins, terminal boards, insulating sleeveings and a complete brushholder assembly all molded of nylon.

The gyro was used during the war as an essential part of intricate computing gunsights and gun turret stabilization systems but in its peace time application it is the nucleus of important lateral and horizontal stability devices for airplanes.

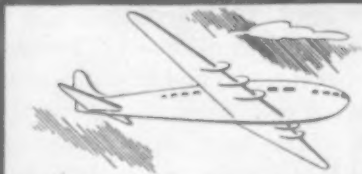
The rate gyro offers a good example of the type of instrument that can be molded of nylon. It must perform its measuring precisely, which requires that all its component parts be molded to detailed specifications and that these various parts fit together with complete accuracy. The use of nylon facilitates precision.

# PROTECT and INSPECT with TRANSPARENT PLASTICS

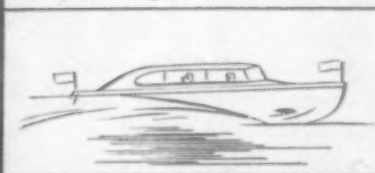
Transparent acrylic plastic is the ideal material to use when strength, transparency and the ability to be formed into simple or compound curves are desired. Acrylic plastic transmits every color of the spectrum with 92% efficiency, and retains its transparency permanently despite aging and weathering. That's why acrylics are the best material for shields and housings on all types of products where it is desirable to observe inner workings, or when a formed part must possess excellent optical properties in addition to strength and resistance to breakage.

Transparent acrylics can be furnished as a sandwich structure in which the center core is made of Butacite for obtaining greater strength and impact resistance. The laminating does not materially change the optical properties which, in turn, makes these materials ideal for aircraft canopies, instrument cases, machine safety shields, marine windshields, lighting shields, roof panels on busses and taxicabs, and a host of other applications.

Because of our long association with aircraft companies in developing new parts and helping solve production problems, you will find our engineering experience in the fabrication of acrylics most valuable in helping you adapt transparent acrylic plastics to your product.



Our long experience with fabricating aircraft parts has made us a leader in this field. Aircraft canopies and astradomes are among the many fabricated acrylic parts that roll continuously from our production line.



Curved windshields and windowpanes for boats can be successfully produced with fabricated transparent plastics.



For food, dairy, or processing equipment where the processed material must be observed, transparent acrylic plastics are becoming increasingly valuable.

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Water flows from faucet through melamine unit filled with synthetic mineral which softens the hardest water

## Water softener

THOSE who live in hard water areas are doubtless familiar with the many water problems that must be endured—dark rings around the bathtub, sudsless soap water, drinking water that tastes of chemicals. These are just some of the things that water softener apparatus can completely eliminate. Besides these, a water softener effects economies by saving on soap and by cutting down the wear on clothes that must otherwise be rubbed too hard in laundering.

Unfortunately, softener equipment has not been easy to perfect. At times it was found that in storing purified water it reverted to a state as unpleasant as the hard water itself. After some experimentation with materials the Best Water Softener Co., 1417 W. Jefferson Blvd., Los Angeles, Calif., decided upon Melmac 3020 as the material best suited for their unit.

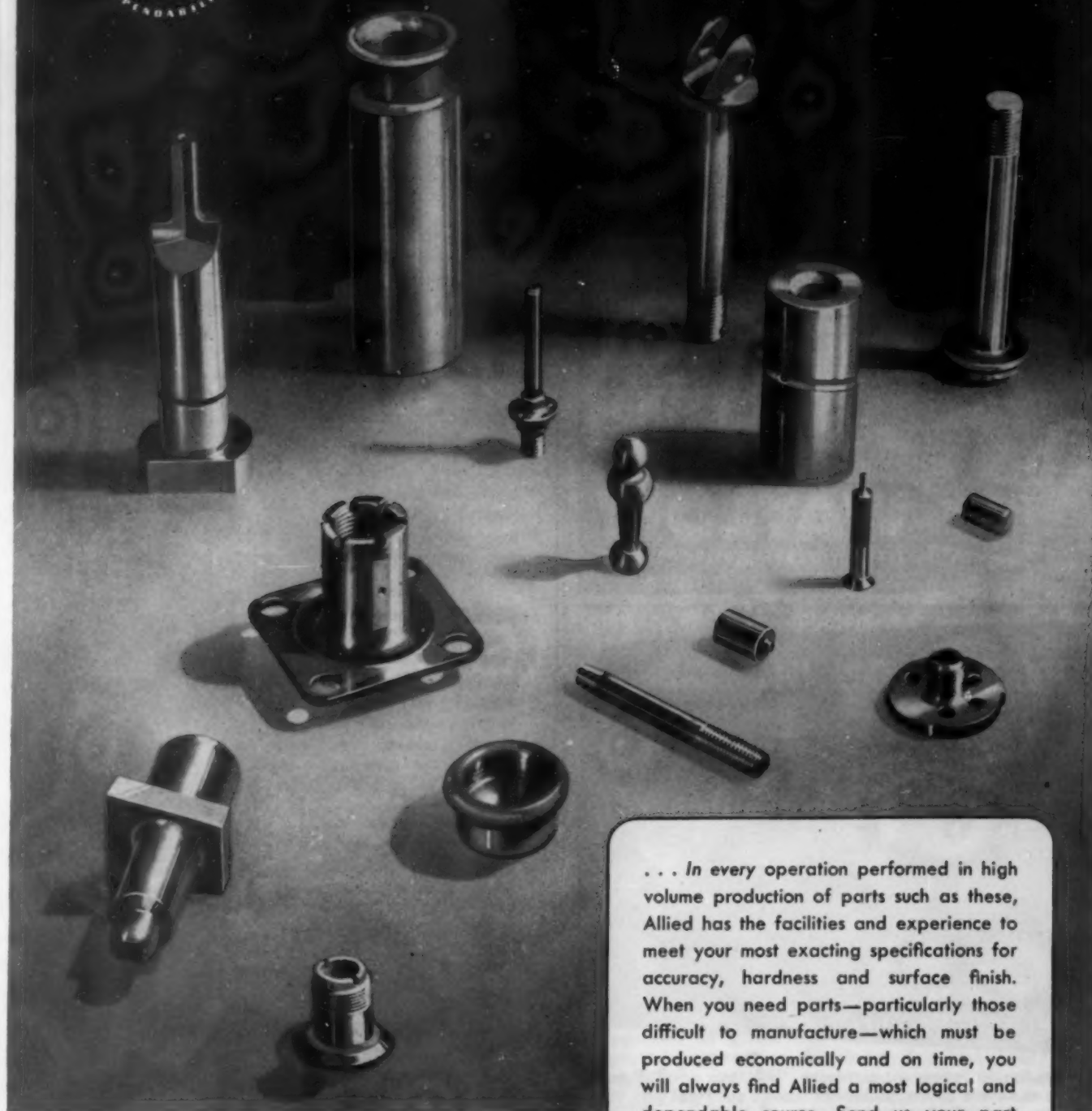
The principal reason for the choice of fabric-filled melamine was that it does not corrode and thus affect the purity of the water. It is tasteless and odorless and therefore cannot pass on any unpleasantness to the purified water.

Because the softener can be made in various colors it is attractive and easy to merchandise. The upkeep of the outer surface is simplified because it requires no painting or maintenance other than cleaning with soap and water. High shock resistance and resistance to boiling water give the melamine material its necessary characteristics for long, hard service.

The spout and base, as well as the housing of the softener, are molded of Melmac by Hydropack, 5715 S. Hoover St., Los Angeles, Calif. Metal outlets for the water are molded right into the plastic parts.



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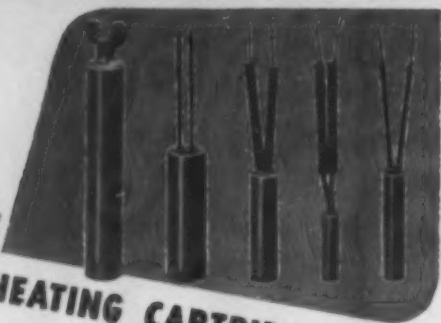
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SHEET METAL DIES FROM THE LARGEST TO THE SMALLEST • JIGS • FIXTURES • STEAM-HEATED PLASTIC MOLDS  
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### WATLOW ELECTRIC HEATING CARTRIDGE UNITS



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Where heating conditions require concentrated, self-contained units, holes may be drilled and reamed—and Watlow Cartridge Units inserted. Watlow Units are accurately machined.

Some of the types are shown in the photo above—with terminals, fixed leads or flexible leads.

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Since 1911

# Consumption of

**T**HE DECLINE in plastics materials consumption since January becomes apparent with publication of the latest Census Dept. figures. Acetate and mixed ester molding materials show a steady decline from 7,600,000 lb. in January to 5,400,000 lb. in April. Acetate sheeting is down only slightly from 1,450,000 in January. Polystyrene continues between 6,000,000 and 7,000,000 lb. with January at 7,400,000. Consumption will have to pick up if the total is to reach

## PLASTICS AND SYNTHETIC RESIN PRODUCTION From Statistics Compiled by Bureau of

### Materials

#### Cellulose acetate and mixed ester plastics<sup>a</sup>

##### Sheets

Continuous (under 0.003 gage)

Continuous (0.003 gage and upward)

All other sheets, rods and tubes

Molding and extrusion materials

##### Total

#### Nitrocellulose plastics<sup>a</sup>

##### Sheets

Rods and tubes

##### Total

#### Other cellulose plastics<sup>a, c</sup>

#### Phenolic and other tar acid resins

Laminating (dry basis)

Adhesives (dry basis)

Molding materials<sup>a</sup>

All other, including casting (dry basis)<sup>d</sup>

##### Total

#### Urea and melamine resins

Adhesives (dry basis)

Textile and paper treating (dry basis)

All other, including laminating (dry basis)<sup>d, e</sup>

##### Total

#### Polystyrene<sup>d, f</sup>

#### Vinyl resins

Sheeting and film, including safety glass sheeting<sup>a</sup>

Textile and paper coating resins (resin content)

Molding and extrusion materials (resin content)

All other, including adhesives (resin content)<sup>d</sup>

##### Total

#### Miscellaneous resins

Molding materials<sup>a, g</sup>

All other (dry basis)<sup>d, h</sup>

##### Total

#### Grand Total

<sup>a</sup> Includes fillers, plasticizers and extenders. <sup>b</sup> Includes operations of one company not previously reporting; however, this does not appreciably affect the comparability with previous months. <sup>c</sup> Includes methyl and ethyl cellulose and related plastics. <sup>d</sup> Excludes data for protective coating resins.

# plastics materials

150,000,000 lb.—the figure that the industry is thought to be aiming at for 1947. Miscellaneous molding materials, which include urea, melamine and acrylics are still running close to the January figure of 5,600,000. Vinyls are holding close to the January figure of 17,000,000. Phenolics are slightly below January when the total was almost 27,000,000 with the molding powder figure apparently stabilized at a figure of around 15,000,000 pounds.

IN POUNDS FOR JAN. THROUGH APRIL 1947  
Census, Industry Division, Chemical Unit

March 1947	April 1947	Totals for first 4 months—1947
lb.	lb.	lb.
705,558	738,552	2,924,318
582,618	581,652	2,280,417
322,254	441,465	1,568,428
6,461,443	5,357,103 <sup>b</sup>	26,556,528
8,071,873	7,118,772	33,329,691
848,158	937,101	3,679,847
380,350	392,243	1,793,756
1,228,508	1,329,344	5,473,603
318,362	331,455	1,685,554
3,228,409	3,590,468	13,392,378
1,717,133 <sup>c</sup>	1,952,870	6,882,078
15,569,325	15,110,274	58,129,911
6,282,508	5,652,425	25,095,538
26,797,375 <sup>c</sup>	26,306,037	103,499,905
3,820,244 <sup>c</sup>	4,187,095	16,144,390
1,778,658	1,482,914	6,124,420
801,877	615,180	3,081,062
6,400,779 <sup>c</sup>	6,285,189	25,367,872
6,561,427	7,096,129 <sup>b</sup>	28,052,828
5,853,130	5,980,883	23,161,766
1,141,959	1,424,463	4,696,150
6,921,487	6,890,397 <sup>b</sup>	25,958,506
3,080,936	2,020,746	10,453,211
16,997,512	16,316,489	64,269,633
5,778,242	4,920,323	21,927,764
2,221,543 <sup>d</sup>	1,904,933	8,907,083
7,999,785 <sup>c</sup>	6,825,256	30,834,847
74,375,621 <sup>c</sup>	71,608,671	292,513,933

<sup>a</sup> Excludes urea and melamine molding materials; see footnote <sup>e</sup>. <sup>f</sup> Dry basis, including necessary coloring material. <sup>g</sup> Includes data for urea and melamine, acrylic acid and miscellaneous molding material. <sup>h</sup> Includes data for petroleum resins, acrylic acid ester resins, mixtures and synthetics. <sup>i</sup> Revised.



## WHEN A MAINE MAN TAKES A JOB



"When I took my job here, I took it with the intention of keeping it. Now there's only one way to keep a job—and that's to do it well. Been here eleven years now, but that isn't long for a Maine man. Come back eleven years from today, and I bet you'll still find me here.

"Meanwhile, my son has been discharged from the army and has joined the same plant. I'm mighty pleased about this. I like the company so well, that I wouldn't want my son to work anywhere else. He likes it here, too.

"My boy wasn't the only Maloon to put on a uniform. I'm a lieutenant of the State Guard. I like to feel I'm being useful—useful when I'm at work—useful during my spare time.

"I have lots of hobbies, too—chief one's bird hunting. I have three dogs and I raise pheasants for training. Like amateur photography, too. Hobbies keep a man keen—keep his mind keen, his eye keen and his hand keen.

"I have a job that I like—I have hobbies that I like. I can say truthfully that it's a great life up here in Maine."

*Leonard E. Maloon*

We could talk about Maine's moderately priced power—about Maine's proximity to America's largest industrial goods and consumer ace markets—about Maine's rich resources, pure processing water, fair taxes, year round "production weather", excellent transportation facilities. But the big plus about Maine as a site for industry, is that the spirit of Mr. Maloon is typical of the working men and women throughout Maine.

It would pay to investigate the industrial possibilities of Maine, if you are thinking of moving, expanding or decentralizing. Send for free booklet, "Industrial Maine".

**STATE OF MAINE  
PLASTICS  
INDUSTRY**

MAINE DEVELOPMENT COMMISSION, STATE HOUSE, AUGUSTA, MAINE

**Hold Parts Firmly  
in Position  
at Low Cost**



**Use  
DE-STA-CO TOGGLE CLAMPS  
in your PLASTIC PRODUCTION  
OPERATIONS...**

Here is a series of De-Sta-Co No. 210-U toggle clamps being used in the cementing of plastic fishing bait. Positive clamping pressure is assured, providing uniformity and precision workmanship on the most exacting plastic production. . . . The use of De-Sta-Co toggle clamps on jigs and fixtures will speed assembly operation of plastic parts and lower the cost of your fixtures themselves. . . . There is a De-Sta-Co toggle clamp ideally suited for all production holding operations. Send for Catalog No. 47 today, De-Sta-Co Toggle Clamps are stocked by the following representatives:

<b>California</b> Norman S. Wright & Co., Los Angeles	<b>Ohio</b> Dia Supply Co., Cleveland
<b>Illinois</b> Geo. A. Riecke Co., Chicago	<b>E. C. George Machine Tool Co., Dayton</b>
<b>Indiana</b> General Supply Co., Fort Wayne	<b>Pennsylvania</b> Paul J. Fleming, Philadelphia
<b>Kansas</b> General Supply Co., Indianapolis	<b>W. P. Jones (Westval Prod.), Pittsburgh</b>
<b>Kansas</b> Industrial Goods Co., Wichita	<b>Wisconsin</b> Triplex Supply Co., Milwaukee
<b>Massachusetts</b> F. H. Robertson Co., Boston	<b>CANADA</b>
<b>New York</b> Rout-Nesal Co., Buffalo	<b>Ontario</b> Williams & Wilson Ltd., Toronto
<b>John F. Diehl Co., New York City</b>	<b>Williams &amp; Wilson Ltd., Windsor</b>
<b>Fink Tool Co., Rochester</b>	<b>Quebec</b> Williams & Wilson Ltd., Montreal
<b>M. J. Kelly Supply Co., Syracuse</b>	

**DETROIT STAMPING CO.**  
*Established Over 30 Years*  
**327 Midland Ave. • Detroit 3, Mich.**

## A vinyl dip-coat

**T**YGOFLEX, something different in a dip-coat compound, has been recently placed on the market by U. S. Stoneware Co., Akron 9, Ohio. The vinyl compound may be used for coating rods, pipe, metal baskets or similar materials with a plastic coating of from  $1/16$  to  $1/4$  in. for each dip.

A vinyl base compound, without solvents of any type, it is rated as a 100 percent resin and consequently unlikely to contain pinholes or bubbles in the finished state. Because of vinyl's natural resistance to chemical corrosion, this coating compound is particularly applicable for use in coating or lining metals, ceramics, glass, heat resistant plastics used in chemical plants. It may also be used for molding, casting, dipping and extruding. While the black is standard, any other desired color can be supplied on special order.

No heat is required in the dipping process except that the item to be coated should be warmed before and after coating. It can be adhered to the object over which it is coated or may be stripped off in the form of a tube or other design according to the shape of the object which has been coated. The material may also be poured in a mold and pressurized into forms such as gaskets. A notable feature is that it will withstand 250° F., which makes it a highly regarded gasket ma-

**Table I.—Properties of Fuzed Tygoflex 60**

	Cast
Color	Black
Specific gravity	1.20
Durometer hardness, Shore A	59±2
Tensile strength, p.s.i.	1250
Ultimate elongation, %	410
Permanent set, %	37
Tear resistance, lb. per in.	240
Compression set	
Method A, 50-lb. load, %	15
Method B, 25% deflection	64
30% deflection	66
35% deflection	69
Brittle point, Method A	-40° F. passes 70° F. fails
Flammability	
0.100-in. thick specimen	Self-extinguishing
0.120-in. thick specimen	...
Abrasion resistance, wear factor	
at 5000 cycles	18±2
at 10,000 cycles	18±2
Water absorption, %	1.0
Effect of heat and age	
Tensile, original, p.s.i.	1290
Tensile, aged 25° C., 72 hr.	1245
Tensile, aged 82° C., 72 hr.	1320
Elongation, original, %	425
Elongation, aged 25° C., 72 hr.	415
Elongation, aged 82° C., 72 hr.	430
Hardness, original, Shore A	51±2
Hardness, aged 25° C., 72 hr.	58±2
Hardness, aged 82° C., 72 hr.	59±2



PHOTOS, COURTESY U. S. STONEWARE CO.

Coating thickness up to  $\frac{1}{4}$  in. can be obtained with single application of this dip coat compound with vinyl base

terial. It can be easily removed from mold by hand. The material may be used as following:

1. As a coating or lining to form a thick, flexible, impermeable membrane, with control over the thickness ranging from  $\frac{1}{64}$  to  $\frac{1}{4}$  inch.
2. As a dip solution to form products by the immersion of a hot form, followed by subsequent fusion, and stripping from the form.
3. By casting into a heat resistant mold and subsequently fusing by heat.
4. By compression or injection molding—inserting the liquid Tygoflex or pre-blended Tygoflex and Tygoflex 60-M molding powder into suitable

(Properties of Fuzed Tygoflex 60 (continued))

Molded	Method
Black	
1.20	ASTM D-792-44T
59±2	ASTM D-676-44T
1175	ASTM D-412-41
400	ASTM D-412-41
33	ASTM D-412-41
225	ASTM D-624-44
16	ASTM D-395-40T
68	ASTM D-395-40T
68	
68	
-40° F. passes	ASTM D-736-43T
-70° F. fails	
...	ASTM D-635-44
Self-extinguishing	
18±2	Taber
18±2	
1.0	ASTM D-570-42
	USSCO P-13
1045	
1100	
1260	
330	
380	
410	
52±2	
58±2	
59±2	

# MOLDING: POWDERS

cellulose acetate  
cellulose acetate  
butyrate  
ethyl cellulose  
polystyrene  
available in  
all colors  
or  
crystal-clear

Franklin Jeffrey—a new source for molding powders—but an old hand at the job. With a background of 16 years in the manufacture of plastic molding powders, we're at your service to provide you with the best materials.

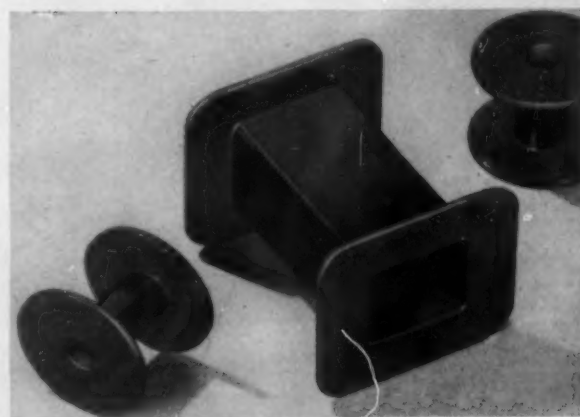


1671 McDonald Ave. ESplanade 5-7995 Brooklyn 30, N. Y.

## COMPRESSION AND INJECTION • MOLDMAKERS AND CUSTOM MOLDERS



Bobbins...



**Tooled** to build efficient molds for fast economical production... **Experienced** in planning and delivering millions of Customolded parts... **Skilled** in meeting precision specifications on difficult operations. Name your Customolding requirements. Midwest will measure up.



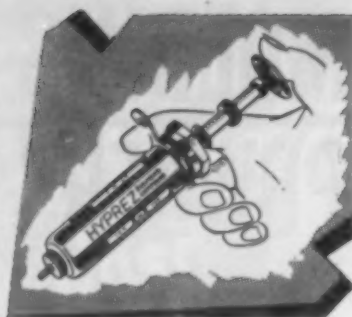
**Midwest Molding**  
AND •Manufacturing COMPANY•

331 N. WHIPPLE ST. • CHICAGO 12 • PHONE: KEDzie 1057

# HYPREZ DIAMOND COMPOUNDS



Cadillac Steering Wheel Medallion with curved clear plastic cover. A delicate job, superbly done by Heasler Cardinal Corp., Evansville, Ind., in Hyprez-polished molds.



## For FLAWLESS PLASTIC MOLDING

Intricate or simple molds are finished faster, better and at lower cost with Hyprez. True mirror polish assures longer mold life, and a product of perfect surface luster.



A complete range of color-identified compounds for all mold finishing operations furnished in sealed cartridges for the Hyprez-Applicator Gun.

HYPREZ DIVISION  
**ENGIS EQUIPMENT COMPANY**  
431 So. Dearborn St., Chicago 5, Ill., U.S.A.

## Safety in Numbers

### SALES REPRESENTATIVES

**WATERMAN ENGINEERING CO.**  
721 Center Ave., Evanston, Ill.  
**INDUSTRIAL EQUIPMENT CO.**  
170 Franklin St., Buffalo, N.Y.  
**RAMSAY PUMP AND SUPPLY CO.**  
1104 Rossman Bldg., Pittsburgh, Pa.  
**BONHAYS & SARTER**  
2013 Olive St., St. Louis 3, Mo.  
**LYTLE ENGINEERING CO.**  
4300 Euclid Ave., Cleveland, Ohio  
**URGENT SERVICE**  
10300 Wilshire Dr., Denver 2, Cal.  
**MALESON COMPANY**  
5th and Chestnut Sts., Phila. 5, Pa.  
**PUMP EQUIPMENT & ENGINEERING CO.**  
236 Main St., Cambridge, Mass.  
**G. H. PERCE JR.**  
610 So. Main St., Hartford, Conn.  
**JACK BREWER**  
1121 S. Broadway, Los Angeles, Calif.  
**POWER SUPPLY SPECIALTY CO.**  
1422 Niles Esperson Building  
Houston 2, Texas  
**LENN AND ALLEN**  
70 E. 42nd St., New York, N.Y.  
**EBERT & BIRKMAN CO.**  
321 Brown Store Building  
Birmingham, Ala.

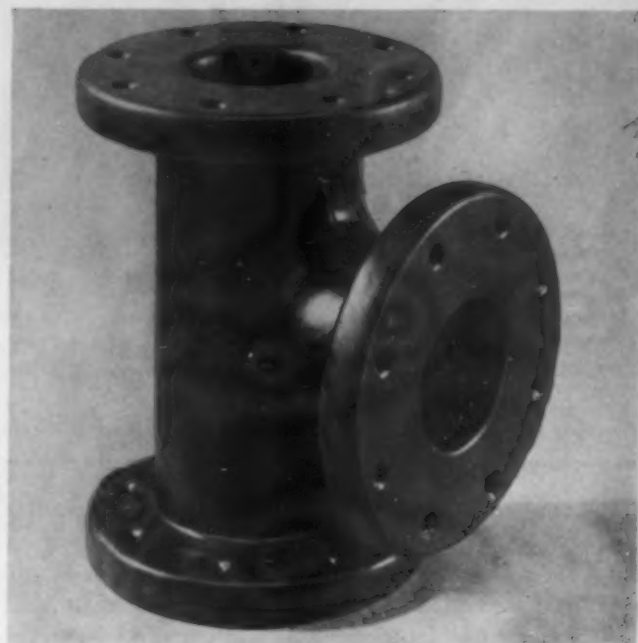


### GREER HYDRAULIC ACCUMULATORS

Hydraulic presses work better and produce more when equipped with Greer Accumulators. Some multiple press installations make use of one huge gravity-type accumulator for supplying fluid to a number of hydraulic presses. Failure of the accumulator causes stoppage of all presses until repairs are made. Eliminate these costly stoppages and keep production on-the-go by using one Greer Accumulator for each press. Then, if one press takes time out for repairs, the others will keep right on going. It's economical too, for several Greer units cost less than one gravity accumulator. Buy yourself some cheap insurance against work stoppage. Remember, "There's safety in numbers." Send for Bulletin, Accumulators for Industry.

### GREER HYDRAULICS, Inc.

454 EIGHTEENTH ST., BROOKLYN 13, NEW YORK  
WEST COAST OFFICE  
359 S. ROBERTSON BLVD., BEVERLY HILLS, CAL.



Vinyl dip coat covered valve body is one use of material. Compound may also be used to coat rods, metal baskets

mold, applying heat as well as low pressure.

5. For the production of supported or non-supported films by the usual spreading techniques, followed by heat fusion.

Tygoflex may be finished by conventional rubber and plastics finishing methods. In applying this compound as a coating the company suggests that:

1. The material to be coated should be cleaned and if adherence is desired, be slightly roughened.
2. A brush coat of Tygoflex primer is applied to the part to aid adherence.
3. The part to be coated should be heated in an oven at 350 to 370° F. for 15 to 20 minutes.
4. The part is then removed and, while hot, is immersed slowly in vinyl coating in a manner as to avoid air entrapment or agitation. The part is then allowed to remain in the compound until such time as a suitable thickness is built up.
5. After the surplus has been drained off, the drips are mechanically removed and unevenness in the coating is smoothed out by a spatula and the part is then returned to the oven at the same temperature—350 to 370° F. to be fused.
6. Time of fusion is normally 10 to 20 min. depending upon size of part and thickness of coating.
7. The material will change from a cream color to a transparent amber, to a dark transparent red, to a gloss black. Complete fusion is determined by producing the gloss-black color.

In casting sheets, it is only necessary to provide a suitable casting mold and the compound is poured directly on to a cold mold, avoiding air entrapment during the pouring, allowing the material to flow out completely and then heating in an oven.

A CAST PHENOLIC RESIN OF EXCEPTIONAL QUALITIES

# MARBLETTE

Outstanding among plastics, Marblette has a jewel-like depth and a complete color range which duplicates the appearance of precious stones, tortoise shell and ivory.

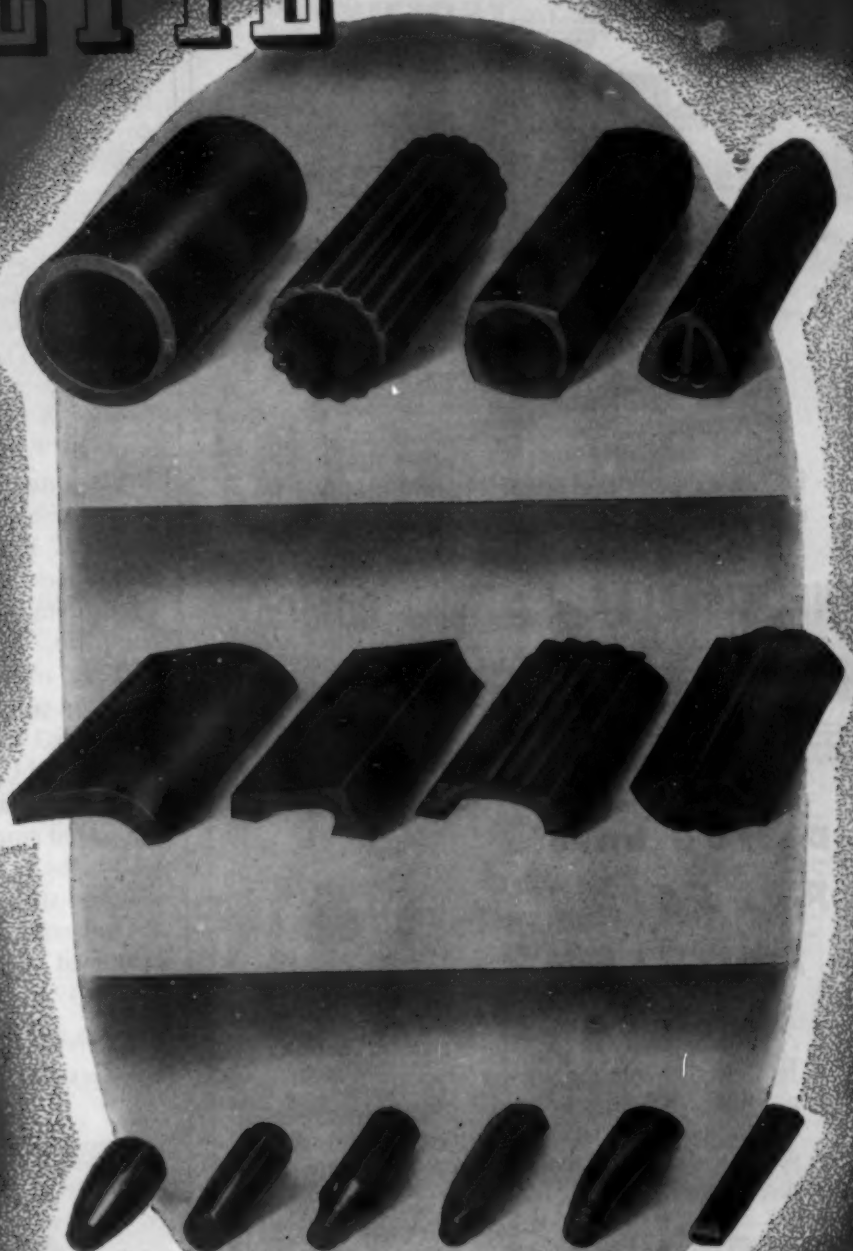
Its almost infinite variety of colors is available in transparent, translucent, opaque, or in mottled effects. Marblette also comes in a water clear form known as "Crystle" in a wide choice of colors.

Marblette's machining characteristics, resistance to oils and acids, non-inflammability and exciting beauty make it ideal for countless manufacturing needs.

**MARBLETTE** will help plan your world of tomorrow. The Marblette staff of engineers offers its services to help with your manufacturing problems. Write to us outlining your needs.

**THE MARBLETTE CORPORATION**

*Manufacturers of Phenolic Resins since 1929*

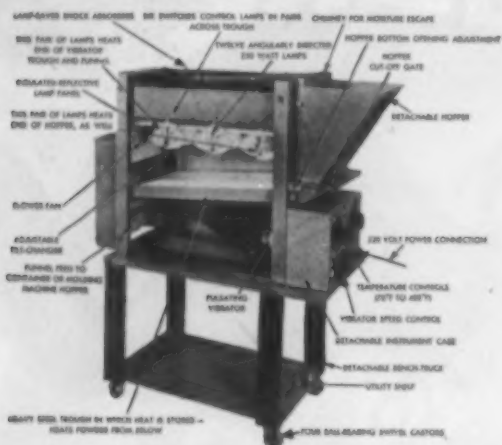


## SPECIAL CASTINGS

Marblette is supplied in sheets, rods, tubes, and special castings such as cutlery handles, kitchen utensil handles, pipe stems, cigarette holders, clock cases, automotive trimmings, jewelry items, buckles, etc. Special shapes made to customer's specifications can be supplied provided draft is all one way.

37-21 THIRTIETH ST., LONG ISLAND CITY 1, N. Y.

## MISKELLA INFRA-RED VIBRA-VEYOR SERVES THE PLASTIC INDUSTRY



For seven years the plastic industry standard for automatically drying and preheating plastic powder granule by granule.

### THE MISKELLA *infra-red* COMPANY

DESIGNERS — MANUFACTURERS OF  
INFRA-RED OVENS • APPLIANCES • SECTIONAL UNITS • MACHINES AND CONVEYORS  
Main Offices and Laboratory  
East 73rd and Grand Ave., Cleveland 4, Ohio

## Do YOU have a PRESSING PROBLEM?



A little ingenuity and a Hein-Werner Hydraulic Jack can provide the answer to many pressing problems in laboratories and plants manufacturing plastic products. We supply the unit and you incorporate its use in a press of your own construction.



Whatever your pressing requirements, the powerful, easy-operating efficiency of Hein-Werner Hydraulic Jacks can provide the capacity to handle the job. Made in Models of 1½, 3, 5, 8, 12, 20, 30, 50 and 100 tons capacity. See your nearest industrial supply distributor, or write us for details.

**HEIN-WERNER CORPORATION**  
WAUKESHA • WISCONSIN

## Styrene radio case

A NEW lightweight portable radio weighing less than 6½ lb. with batteries and designed to play anywhere on AC, DC or batteries, has been developed by Garod Radio Corp., Brooklyn 1, N. Y. The small, compact radio, in a metal case, features a Lustron cover, antenna bushings and handle clips, an extruded Vinylite handle, Vinylite covered antenna connections, a formed transparent cellulose acetate dial and urea knobs. The cabinet size is 6 by 8 by 4½ inches.

The polystyrene cover is molded in two parts by Waterbury Co., Inc., Waterbury, Conn., the outside of the cover being in one mold and the inside panel in another. The loop antenna is built into the cover. Where the leading wires from the antenna come through to the set itself, two small polystyrene bushings, also made by Waterbury, are used as insulation.

The antenna leads from cover to set and is of twisted copper cable covered with clear Vinylite by Tensolite Corp., 17 E. 42nd St., New York City, by means of a new process in which a vinyl tape is heated and wrapped longitudinally around the cable, sealing itself into a complete cover. This sheathed cable was tested by opening and closing the cover over 100,000 times; it stood up perfectly under flexing.

The dial is formed from clear sheet cellulose acetate by Emeloid Co., Inc., Arlington, N. J., and is printed in three attractive colors. Knobs are ivory urea—one with a red marking. They are produced by Waterbury, as are the two end pieces holding the handle. These handles, turned out in a 6-cavity mold, have a plug on the bottom which passes through a hole in the top of the enameled steel case, securing the strap handle. The

*Polystyrene is used for three parts of this radio—the two-part cover, the antenna bushings and the handle clips*





*Vinyl resin, cellulose acetate and urea are used as well as polystyrene in various parts of this lightweight radio*

handle itself is extruded from Vinylite by National Varnish Products Corp., Woodbridge, N. J., in a color which matches the polystyrene cover and other parts.

The set was designed by Philip A. Derham and, according to present plans, will be produced not only in the present plum color but also in a blue case with a white cover, handle and fittings.

#### Plastics Products Addresses (pages 92 to 95)

Amos-Thompson Corp., Amos Molded Plastics Div., 5095 S. Kyle St., Edinburg, Ind.  
 Atlas Instrument Co., 9 Tanner St., Haddonfield, N. J.  
 Chas. C. Briddell, Inc., Crisfield, Md.  
 Cara Sales Corp., 18 E. 48th St., New York 17, N. Y.  
 Claremont Waste Mfg. Co., 169 Main St., Claremont, N. H.  
 Eastman Kodak Co., Rochester 4, N. Y.  
 Franklin Plastics Div., Robinson Industries, Inc., 318 Atlantic Ave., Franklin, Pa.  
 Interstate Mfg. Corp., 125 Sussex Ave., Newark, N. J.  
 Lakeside Plastics Co., Duluth, Minn.  
 MacDonald Mfg. Co., New Baltimore, Mich.  
 Metroloy Corp., 12 Pine Ct., New Rochelle, N. Y.  
 Molded Insulation Co., 335 E. Price St., Philadelphia 44, Pa.  
 Nalle Plastics, Inc., 100-11 W. Second St., Austin 22, Texas  
 Orchard Industries, Inc., 20201 Sherwood Ave., Detroit 12, Mich.  
 Packaging Films, Inc., 74 Grand St., New York City  
 Progressive Products Co., Milford, Mich.  
 Public Service Electric & Gas Co., 1025 McCarter Hwy., Newark, N. J.  
 Pump-It, Inc., Box 123, Hollywood 28, Calif.  
 RC Products, Inc., 1575 Lexington Ave., Brooklyn, N. Y.  
 Ranger-Tennere, Inc., 318 E. 32nd St., New York 1, N. Y.  
 Republic Molding Corp., 4641 W. Lexington St., Chicago, Ill.  
 Tauber Plastics, Inc., 200 Hudson St., New York 13, N. Y.  
 Vitaplast Products, Inc., 161 Bowers, New York City  
 Waterbury Companies, Inc., Waterbury 90, Conn.  
 White Rock Corp., 1 Park Ave., New York City

#### Stock Mold Addresses (mentioned on page 142)

1761-63 Vichet Tool Co., Plastics Div., 3001 E. 87th St., Cleveland, Ohio



**VICTORY of CHICAGO**



## SYMBOL OF EXCELLENCE IN CUSTOM MOLDING OF ALL THERMOPLASTICS

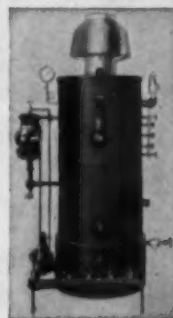
VICTORY has the skills and equipment to design and build the hand model, make the molds and production tools . . . then turn out your product in both quality and quantity, in large or small parts. Also equipped to handle metal inserts. Send us your specifications for an estimate.

### VICTORY MANUFACTURING COMPANY

1724 W. Arcade Place, Chicago 12, Ill.  
ESTABLISHED IN 1930

## "TAILOR-MADE" for your MULTIPLE MOLDING PRESSES

The KANE Automatic, Gas-Fired Boiler . . . built to order for the operating pressure you require . . . is compact . . . can be placed adjacent to the presses it serves. It's economical . . . burns fuel only in proportion to the steam used. It is ideal for multiple press installations. Built to A.S.M.E. specifications . . . in sizes 1 to 30 H.P.



Also available for individual presses . . . the KANE Low Water Line Automatic Gas-Fired Boiler . . . in sizes 1 to 5 H.P.

#### the M-K-O

#### Automatic Boiler Feed . . .

designed to automatically pump hot condensate, plus any required make-up water, into a boiler, without manual attention, to maintain a practically constant water level at the point most economical for highest boiler efficiency.



Although current demands cannot be supplied immediately, we'll try to fill your urgent needs as soon as we can.

### MEARS-KANE-OFELDT

1903, 1915 EAST HAGERT STREET, PHILADELPHIA 25, PA.  
FOUR DECADES OF AUTOMATIC GAS-FIRED BOILER MANUFACTURING EXPERIENCE

## IS PROFIT MAKING YOUR JOB?



If profit making is your job, and if you are having trouble reducing your high pressures, you can help conditions immensely by using the

### ATLAS Type "E" High Pressure Reducing Valve

which we show at the left. That valve is now being used by all of the leading plastics plants and the fact that we receive repeat orders, day after day, surely proves that Type "E" is quite satisfactory. It handles pressures up to 6,000 lb. per sq. in. *without shock*. Oil, water, or air,

#### WHY Is Type "E" Profitable?

It is made *correctly*, and of the best materials obtainable for the various purposes. Thus for example the body is made entirely of forged steel.

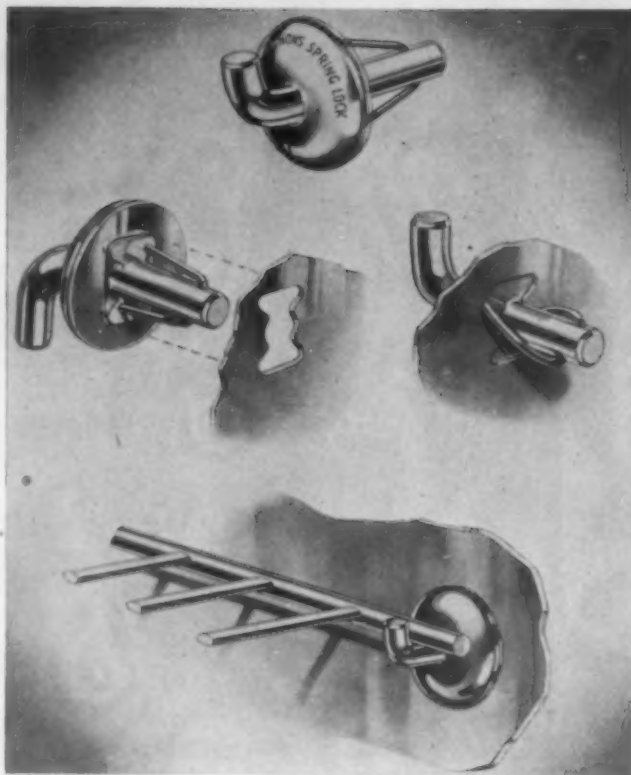
All internal metal parts are wholly of stainless steel. A formed packing of special material superior to leather is used which is immune to all fluids commonly used in hydraulic machinery. The pressure on the seat is balanced by a piston with the result that variations in high initial pressure have little effect on the reduced pressure. Ask for complete information.

For other ATLAS plastics plant products see the partial list in our ad in the January 1947 issue of MODERN PLASTICS

## ATLAS VALVE COMPANY

REGULATING VALVES FOR EVERY SERVICE

277 South Street, Newark 5, N. J.  
Representatives in Principal Cities



This drawing of one-piece shelf support applied to a refrigerator shows its hook-shaped construction (top), how fastener is assembled in inner lining with acetate washer and fastener after complete assembly (the bottom view)

## A support fastener

A BLIND one-piece shelf support is the newest application to be developed by the Simmons Fastener Corp., Albany 1, N. Y., for its Spring Lock fastener. Designed to hold such things as refrigerator shelves, the new lock provides a fastener installation that does not require nuts or bolts. It can, for example, be installed in the inner lining of the refrigerator after the refrigerator has been completely assembled. This feature provides for easy replacement by a householder of broken or bent shelf supports.

A cellulose acetate washer, stamped from a strip or sheet, prevents marring of porcelain refrigerator wall during insertion of the fastener and while the fastener is in use. The fastener is also provided with locking keys for perfect alignment and positive positioning which help in the speedy installation of the unit.

#### Construction of the head

The head of the fastener is constructed in the form of a hook in which the shelves lie. Any type of head can be supplied without affecting the fastener principle. The spring action of the hook provides a tight, vibrationproof installation when locked in place by a quarter turn in a clockwise rotation.

## ORGANIC PEROXIDES

CATALYSTS FOR POLYMERIZATIONS  
DRYING ACCELERATORS • OXIDATION  
AGENTS • BLEACHING AGENTS

**LUCIDOL**

(BENZOYL PEROXIDE)

**LUPERCÓ**

(PEROXIDE COMPOUNDS)

**ALPEROX C**

(TECHNICAL LAUROYL PEROXIDE)

**LUPEROX**

(PEROXIDE PASTES)

Special Organic Peroxides

REGISTERED



TRADE MARK

## LUCIDOL DIVISION

NOVADEL-AGENE CORPORATION  
BUFFALO 5, NEW YORK

***There's PERBUNAN***  
***in this U. S. Rubber***  
***product . . .***



Perbunan was selected by United States Rubber Company engineers and technicians for the tube of their U. S. Peerless Fuel Oil-Distillate Hose because of its

- *Ability to handle a wide variety of petroleum hydrocarbons . . . ranging from fuel oil to aviation gasoline.*
- *Aging qualities required for a rugged, long-life hose . . . one that is adaptable for either home fuel oil delivery, or for airplane refueling.*
- *Flexibility . . . in sub-zero weather . . . and trouble-free service on hottest summer days.*

Perbunan now contains a *new stabilizer* that permits it to be used in delicate colors where good color stability during service is desirable.

If you have any rubber compounding problems, call on our rubber engineers. They will gladly cooperate. Or write to the nearest address below.

For Improved Rubber Parts . . . Compound with ➔

Resists damage from water, oil, excessive heat, abrasion and petroleum hydrocarbons . . . retains flexibility at sub-zero temperatures!

**ENJAY COMPANY, INC.** (Formerly Chemical Products Department, Stanco Distributors, Inc.) 26 Broadway, New York 4, N. Y.; First Central Tower, 106 South Main Street, Akron 3, Ohio; 221 North LaSalle St., Chicago 1, Illinois; 378 Stuart Street, Boston 17, Mass. West Coast Representatives: H. M. Royal, Inc., 4814 Loma Vista Avenue, Los Angeles 11, California. Warehouse stocks in Elizabeth, New Jersey; Los Angeles, California; Chicago, Illinois; Akron, Ohio; and Baton Rouge, Louisiana.  
Copyright 1947, Enjay Company, Inc.



**THE RUBBER THAT RESISTS OIL,  
 COLD, HEAT AND TIME**

## COLONIAL RIGGING and HAULAGE CORP.

formerly  
KRASILOVSKY BROS. TRUCKING CORP.  
MASTER RIGGERS and HEAVY HAULERS



Specialists in handling plastics machinery  
From assembly line to  
floor of your plant.

**SKILLED • EXPERIENCED • INSURED**

5 Corlears Street New York, N. Y.

GRamercy 5-7850



*promise keeper!*



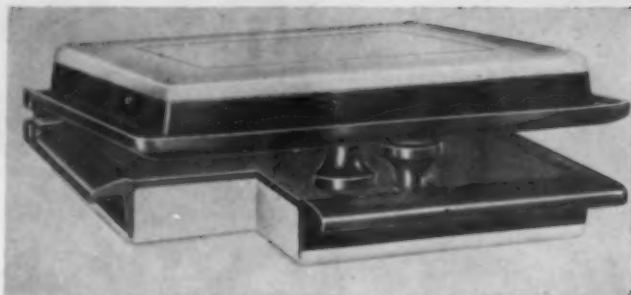
If your problems involve large scale production with delivery dates to meet—you'll find Hobbed Cavities a great help in keeping promises. We'll be glad to show you why Newark Hobbed Cavities are the choice of so many plastic molders.



For further information, please write for our brochure "The Procedure of Die Hobbing".

**NEWARK DIE COMPANY, Inc.**  
20-24 SCOTT ST. NEWARK, N. J.

Telephone: Market 2-3772, 2-3773



PHOTO, COURTESY GENERAL MOTORS CORP.

Ice cream cabinet lid, half of which is turned back as when open, has shell, foamed insulation of polystyrene

## Styrene cabinet lid

**J**UST IN time for the hot summer days, comes a new polystyrene lid for ice cream cabinets. Being 50 percent lighter in weight than other lids currently produced, it promises to relieve the efforts of the soda jerk. Because it is also very sturdy, the lid will take all the banging around that fountain clerks give it.

A product of many years' experimentation, this ice cream cabinet lid has been put on the market by the Frigidaire Div. of General Motors Corp., Dayton, Ohio. The outer shell of the lid is injection molded of polystyrene while the inside insulation is of foamed polystyrene, held in place by stainless steel reflector plates. Both the shell and the insulation have very low heat conductivity offering a more efficient means of keeping the ice cream hard.

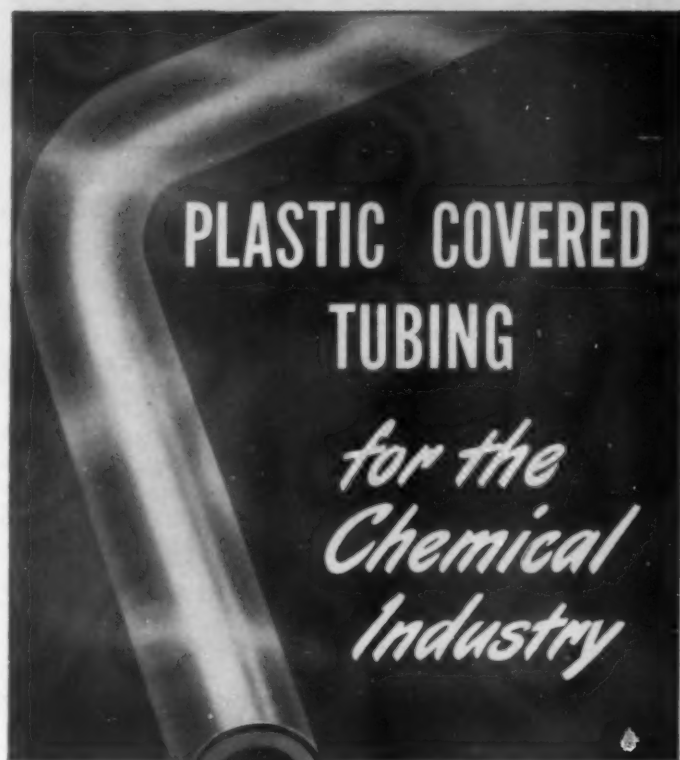
### Importance of weight

The importance of the light weight of the lid can be realized by counting the number of lifts made by an attendant in one day and the pounds in weight that are saved by using the new lid as against more conventional lids. Because the lid weighs only five lb., an accumulated lift amounting to about 250 lb. can be eliminated when raising the half-section 100 times during a day. From this it can be seen that the saving of weight not only becomes a saving in physical energy but one in time.

Tightness of fit is greatly improved in the polystyrene lid and helps to cut down on condensation as well as heat losses. A resistance to cracking and chipping contributes to the practicality and appearance; and the special design of the shell increases resistance to shock.

Frigidaire also incorporates leak-proof hinges and offset knobs in its new lid, and all component parts are available for replacement.

All new model ice cream cabinets produced by General Motors Corp. are now being equipped with plastic lids and a limited quantity of lids are being made for replacement. These are interchangeable on this company's "all steel" cabinets and, with the rubber breaker strip in place, fit openings 10½ by 21 inches.



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Industry*

Plastic  
Cover



Protection of pipes leading to delicate instruments is a serious problem faced by the chemical industry. These pipes of steel or brass are subject to corrosion from fumes and acids unavoidably present in many chemical operations. Such corrosion if unchecked may cause serious damage to expensive delicate instruments.

To meet this problem Carter has developed a special method\* of covering metal pipes with a protective coating of Vinyl, proof against acid, fumes or any corrosion agent. It is tough, will not chip or peel, flexible, readily bending to conform to any position of the pipe. This covering of Vinyl or any other thermoplastic, can be applied to your pipe according to your specifications in any quantity, size or color desired.

Carter plastic tubing extruded to order in all shapes, sizes and color, flexible or rigid, opaque or transparent is noted for its close tolerances. On your tubing problems or any extruded plastics problem *it's smarter to consult Carter.*

\*Patent applied for.



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*Manufacturers of Extruded Plastics*  
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The PLACO LAMINATING PRESSES are used primarily for laminating PLACOLITE\* plastic films on photos, and identification cards, charts, lithoprints, displays, direct mail, etc., gives complete protection against moisture and discoloration, renders them tamperproof. Three minutes are all the time needed for complete laminating cycle.

The presses are low in cost and can be used for laminating or wherever a small hydraulic press is needed. They offer opportunities for either supplementing regular production methods or for setting up a laminating business.

PLACO Presses are easy to operate. We supply complete instructions on inks, plastic films, paper to use, so that you will get best laminating results. Our presses have been thoroughly tested and found satisfactory on all laminating jobs.

Put one of these practical presses to work for you. Write or call for descriptive folder.



↑ Portable PLACO M-10 press will take up to 6½" x 9¼" work. Is ideal for smaller work. Eighteen ton capacity.

Floor model M-50 has 40-ton capacity and has platen 10½" x 12½" Excellent for larger work, displays, or for accommodating several smaller pieces at one time. ➔

*Plastic LAMINATING Corp.*

Vaux Hall

New Jersey

\*Trade name

JULY • 1947

165

# Books and Booklets

Write directly to the publishers for these booklets. Unless otherwise specified, they will be mailed without charge to executives who request them on business stationery.

## The Chemistry of Commercial Plastics

by Reginald L. Wakeman

Published by Reinhold Publishing Corp., 330 W. 42nd St., New York 18, N. Y., 1947

Price \$10.00

836 pages

This comprehensive up-to-date book covers not only the chemistry of commercial plastics but also their processing and applications. It strikes a mean between student's text and technical reference. Background information is presented in a general history and survey of the development of synthetics, and is subsequently expanded into specific details on various materials, including raw materials, natural resins, cellulose and the entire field of current plastics. Emphasis is placed on the principles of resinification and on mechanical manipulation of plastics. Individual materials and groups of materials are adequately discussed in a logical pattern. Descriptive matter is not cluttered with chemical formulae; nevertheless, these are given as dictated by clarity. Atmosphere photographs in conjunction with tables and graphs dovetail the practical applications of plastics with technical data. Convenient references at the end of most chapters, a complete index and list of trade names are additional assets to volume.

## Plastics Monograph Series

Issued by The Executive Committee of the Plastics Industry, Windsor House, Victoria St., London, S. W. 1, 1947

Fifteen of the proposed 31 monographs, largely intended for student use and written in a simple, concise style, have been published. In general, the 10 treatises pertaining to materials outline the properties, manufacturing processes and applications of the principal phenolic resins, phenol-formaldehyde cast resins, synthetic adhesives, urea resins, melamine resins, alkyd resins, casein plastics, natural resins, cellulose nitrate, ethyl cellulose, benzyl cellulose and nylon.

Four monographs deal with the processing of plastic materials including the basic working principles for the fabrication of many thermoplastics, a brief survey of molding by compression, injection and transfer methods, the correlation of mold design and process with performance and information on resins, fillers, impregnation techniques, testing untreated and treated base materials. Of further interest is the booklet discussing the principles of draftsmanship. Issued for purposes of education to members of The Institute of the Plastics Industry (London) and to teachers, these pamphlets may not be offered for sale to the public.

## Plastics Mold Design

by Carrol C. Sachs and Eugene H. Snyder

Published by Murray Hill Books, Inc., Technical Div., 232 Madison Ave., New York City, 1947

Price \$4.50

78 pages

This 9- by 12-in. spiral bound book on mold design is composed of two parts; the first includes a complete discussion of drafting room practice and details on those materials used in mold construction. The necessary steps required in drawing up a mold with reference to part design considerations and mold design procedure are explained, as are the properties of various steels and methods of steel selection.

Part II covers the design considerations for 1) compression

molds, 2) transfer molds, 3) injection molds and 4) extrusion dies. Each of these sections follows the same general outline and covers the principle of the molding method, the types of molds and the various mold parts which are required to produce a completed production mold. A unique feature is the inclusion of several full-sized plastics mold drawings.

**Oil soluble dyestuff**—A circular, G-474, on Helio Oil Red R powder has been released by General Dyestuff Corp., 435 Hudson St., New York City. This typical oil-soluble dyestuff is of particular value for the production of bright bluish-red and pink shades of good to very good fastness to light and heat. Recommended especially for the coloring of thermosetting resins such as urea-formaldehyde, cellulose acetate and methyl methacrylate, it is well suited for coloring of lacquers, resins, oils and waxes.

**Coatings and finishes**—Three brochures on maintenance coating, strip coatings, production and maintenance finishes may be obtained from The Merchants Chemical Co., Elm Court, Stamford, Conn. Of these coatings and finishes, which are all corrosion resistant, Dy-nes-co is formulated from scientifically blended natural and synthetic resins in a hydrocarbon vehicle. It is both primer and finish coat and may be used to protect plant equipment, pipes, steel, wood, brick, etc., against the action of acids, acid fumes, alkalis and atmospheric conditions. Dyna-clad 1060 forms an attractive, flexible, waterproof film immune to practically all acids, alkalis, oils, petroleum derivatives, alcohols and salt water. Dyna-flex 2020 is a solution embodying compounded Vinylite synthetic plastics in organic solvents and has an almost endless number of applications in the protection of air-plane surfaces, precision tools, aluminum, etc.

**Carboloy-tipped cutting tools**—Nelco Tool Co., Inc., 370 Hamilton Ave., Brooklyn 31, N. Y., has published a catalog illustrating and describing their complete line of Carboloy-tipped cutting tools. The catalog contains a simple conversion chart, best resharpening procedures and recommendations for operation and maintenance of Nelco tools.

**Split and tubular rivets**—A catalog of Chicago Rivet & Machine Co. 9600 W. Jackson Blvd., Bellwood, Ind., covers rivet selection and automatic setting machines for various industrial applications. The two-color catalog is illustrated with photographs of such setters as the 12-in. throat floor type, 42-in. throat floor type, the double rivet setter and the 6-in. throat bench type. Specifications are included for all 27 models illustrated.

**Nitrosyl chloride**—The Solvay Process Co., 40 Rector St., New York 6, N. Y., has announced a new booklet on the properties and uses of nitrosyl chloride. Its possible industrial applications include use as a polymerization catalyst and for digesting cellulose materials. In addition to chemical and physical properties, this booklet describes the new all-nickel cylinders and fittings which have been developed for storing and shipping the reddish-brown gas, gives information on handling, laboratory preparation, safety measures and typical industrial applications supplemented with charts and sketches.

**Horizontal drilling and tapping machines**—A bulletin describing three Kaukauna Series 125 units, together with photographs and specifications has been put out by the Kaukauna Machine Corp., Kaukauna, Wis. These portable horizontal drilling and tapping machines combine the operations performed

# A BUYING GUIDE FOR ABRASIVES

## POINT No. 6

### LOCAL DISTRIBUTOR SERVICE



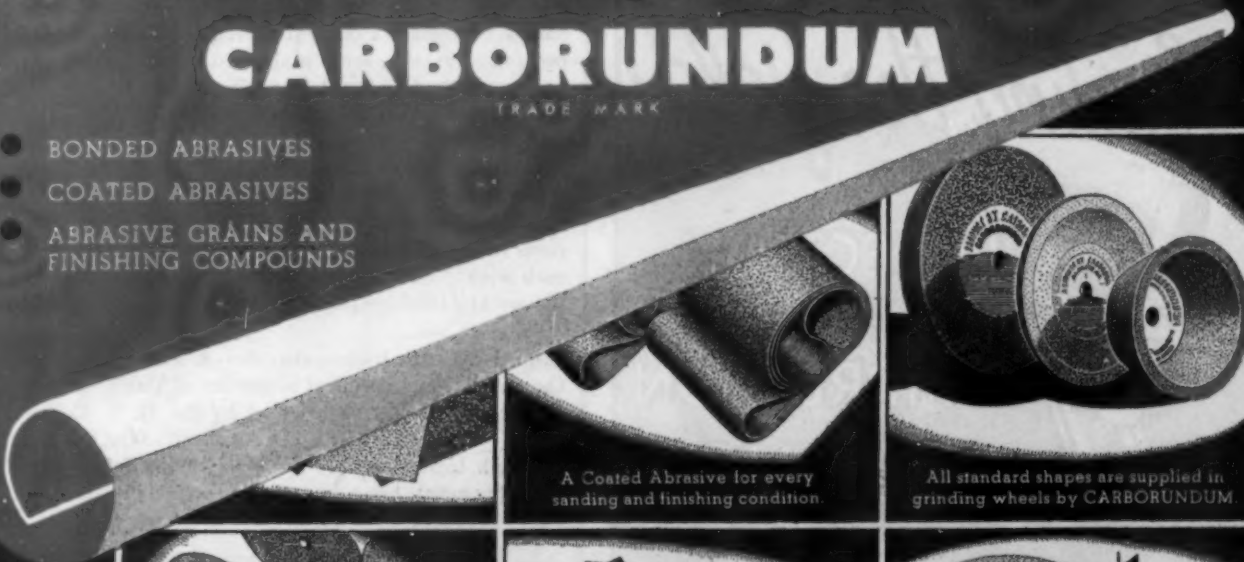
With progressive purchasing methods dictating improved efficiency of supply, the services of your CARBORUNDUM distributor assume increased importance. Prompt delivery of standard wheels, coated abrasives, sticks and stones, and grains by CARBORUNDUM is assured from large and varied stocks conveniently located nearby. Factory inventories of these items can be safely and economically reduced. More efficient use of abrasives is promoted through a local staff, trained by CARBORUNDUM, and familiar with varied applications. They are informed on latest developments and have access to CARBORUNDUM representatives when the problem is too difficult or unusual. Intelligent handling and efficient office routine is also pointed to by some customers who prefer the personal consideration and attention rendered by these modern distribution units. These services account in part for the increasing preference for products by CARBORUNDUM, The Carborundum Company, Niagara Falls, New York.

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- ABRASIVE GRAINS AND FINISHING COMPOUNDS

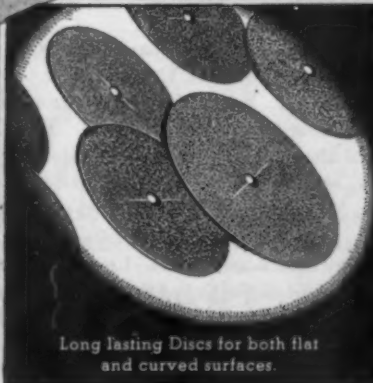


A Coated Abrasive for every sanding and finishing condition.

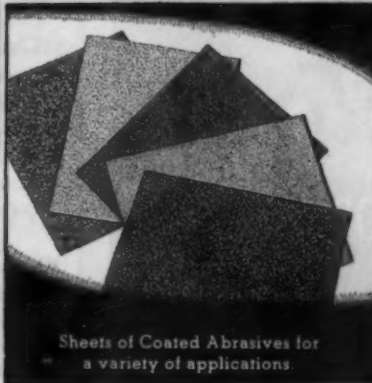
All standard shapes are supplied in grinding wheels by CARBORUNDUM.



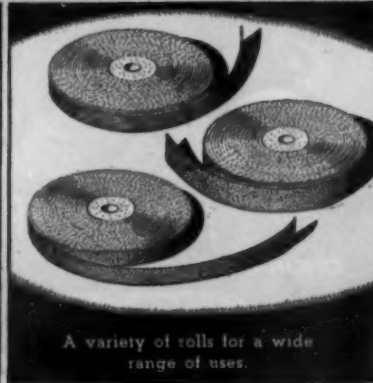
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3-167 GENERAL MOTORS BLDG. MADISON 5781

on conventional radial, horizontal, drilling and tapping machines. Also included is the KMC Model 700 indexing table for use with the series 125 machines or individually.

**Casco gluing chart**—Casein Co. of America, Div. of the Borden Co., 350 Madison Ave., New York City, has prepared a new edition of the Casco gluing chart designed to take the guesswork out of gluing and glue selling. It describes the required properties of glues for various jobs and lists the recommended glues for each job. Data on Cascophen are included.

**Directory of manufacturers**—The *Plastics Buyer*, designed as an aid to buyers of merchandise in the selection of properly engineered plastics products, may now be obtained for \$3.00 from the Cleworth Publishing Co., Inc., 551 Fifth Ave., New York City.

**Intensive mixers**—Photographs and drawings are featured in an eight-page bulletin showing simply and concisely how Struthers Wells Northmaster intensive mixers operate. These mixers are designed for economical, dependable mixing, compounding, plasticizing and processing of plastics, natural and synthetic rubber, asphalt compositions, varnishes and other tenacious materials. Copies may be obtained from Struthers Wells Corp., Titusville, Pa.

**Phthalic anhydride**—The chemical properties, synthesis, reactions and uses of phthalic anhydride are discussed in an attractive four-color booklet received from Barrett Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y. An extensive bibliography of the applications and derivatives of phthalic anhydride is included with charts and tables giving the properties of some of these derivatives.

**Injection molding machines**—H-P-M 9-oz., 4-oz., 16-oz. and 32-oz. are discussed and illustrated in a folder just put out by The Hydraulic Press Mfg. Co., Mount Gilead, Ohio.

**Neoprene latex**—The applications of Neoprene latices as valve linings, coverings for conveyor belts, as hose for barnacle control, packing rings, etc., are contained in the March Neoprene Notebook, published by the Rubber Chemicals Div. of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

**Bibliography of industrial and scientific reports**—The Office of Technical Services, Dept. of Commerce, Washington 25, D. C., is offering a Bibliography of Scientific and Industrial Reports listing an average of 800 reports and technical documents each week. Every report issued by this Office is abstracted in the weekly Bibliography, obtainable for \$10.00 annually.

**Liquid organic hydroperoxide**—A technical brochure listing the physical and chemical properties of Uniperox 60, an organic hydroperoxide, has been issued by the R. T. Collier Corp. of 714 West Olympic Blvd., Los Angeles 15, Calif. This product, although highly reactive as a polymerization catalyst and an oxidizing agent, has a remarkable thermal stability and is insensitive to shock.

**Market guide for Latin America**—Now available from the American Foreign Credit Underwriters Corp., 170 Broadway, New York 7, N. Y., is the fully revised 1947 edition of the "Market Guide for Latin America." This 26th revised edition lists more than 80,000 buyers and agents—wholesalers, manufacturers, retailers, etc.—in all countries of South and Central America, Mexico, Cuba, Puerto Rico and the West Indies.

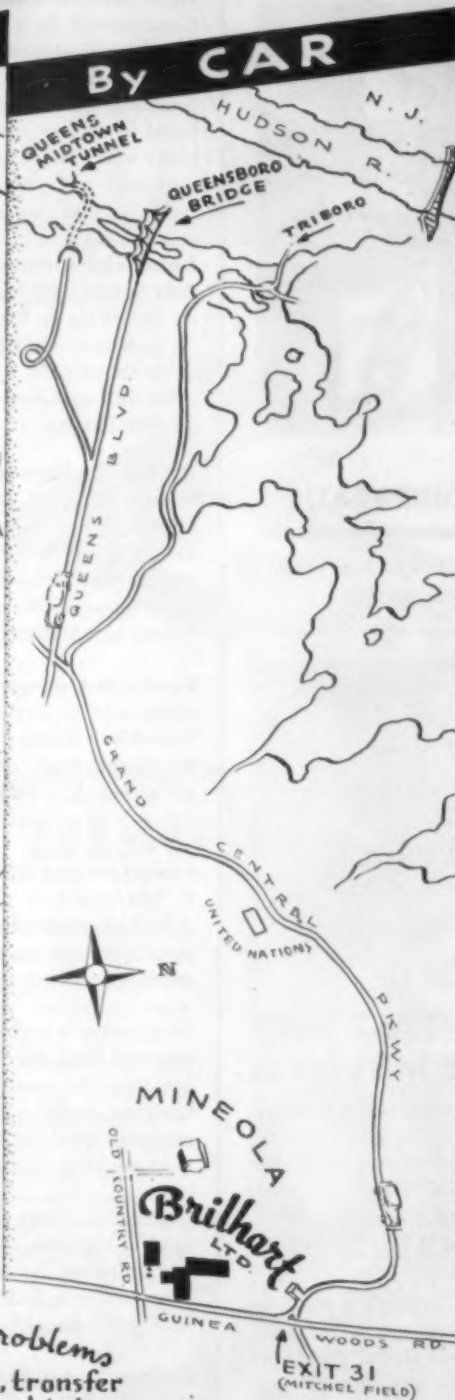
**Rhodanine and 2-aminoethyl sulfuric acid**—Detailed chemical and physical properties of two organic chemical intermediates, Good-rite rhodanine (2-thio-4-keto-thiazolidine) and Good-rite 2-aminoethyl sulfuric acid are presented in technical pamphlets brought out by B. F. Goodrich Chemical Co., Rose Bldg., Cleve-

# It's easy to get to **Brilhart** LTD.

## By TRAIN



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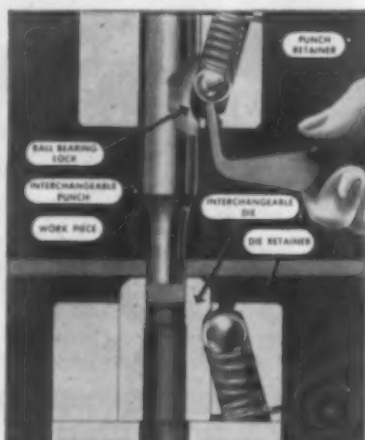
For your tough plastics problems  
in compression, injection, transfer  
molding and precision machining

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Allied's R-B Interchangeable Punches and Dies are quickly installed for trouble-free production in the metal-working and plastics industries. They are available from stock in *standard* round, oblong and square shapes of almost any required size. Specials of any size, shape or material are promptly furnished to your specifications—and delivery dates are *dependable*.

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**SARCO BUCKET STEAM TRAP** Where seconds count and service is hard, no trap is faster nor more rugged than the Sarco Bucket Trap. It is used by the thousands in plastics, textile and chemical plants. It has a straight through connection and a built-in strainer which reduce installation costs.

All mechanism is attached to the cover, providing easy inspection. Can be equipped with Sarco air by-pass. Sizes 1/2" to 2 inch, to 250 lbs. Many other types of steam traps and temperature control for plastics processes are described in the Sarco Bulletins—yours for the asking. 956

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land, Ohio. The former, a crystalline heterocyclic compound, is soluble in alcohol, ether, alkali and hot water and contains an active methylene group. 2-aminoethyl sulfuric acid, a crystalline solid of extremely high purity and useful as an amino-ethylating agent, is readily soluble in water but insoluble in most of the organic solvents.

**Flock and flock finishing**—Just released by Behr-Manning, Troy, N. Y., is a booklet on cut-to-length rayon flock. Adhesives, methods of applying adhesives and flock on various surfaces and the product, said to be free-flowing, are described.

**High styrene rubber resin**—A technical bulletin on Darex Copolymer X-34, a special Buna S type rubber resin having an unusually high styrene content, has been published by Dewey and Almy Chemical Co., Cambridge 40, Mass. Valuable for compounding natural and synthetic rubbers, this hard, tough material has a low specific gravity, light color, complete compatibility with a range of other hydrocarbons, and resistance to aging, chemicals and oils. Suggested techniques for handling and details about its uses are herein presented.

**Industrial finishes**—A complete catalog of revised technical data bulletins on lacquers, enamels and synthetics manufactured by the Maas & Waldstein Co., 438 Riverside Ave., Newark 4, N. J., is now available for distribution. These bulletins contain up-to-the-minute, specific information about the use, characteristics and application methods for the company's various production finishes.

**Extruded plastics**—*Extruded Plastics*, a book published by Detroit Macoid Corp., 12340 Cloverdale, Detroit 4, Mich., contains information on the how and why of extrusion and injection molding, uses for extruded plastics, tool making, factors in the selection of material and on the characteristics of plastics. Among those materials described are cellulose acetate, ethyl cellulose and nylon; also included is a library of over 270 stock extrusions.

**Controlled air-powered devices**—Bellows small air-powered units, said to increase production 30 to 500 percent, are catalogued in a recent publication by The Bellows Co., 798 N. Main St., Akron, Ohio. Among those devices discussed and illustrated are powered feeds, hydro-checks, air vises and cylinders, control valves and accessories for all units.

**Chemical and high-pressure pumps**—Milton Roy Co., 1300 E. Mermaid Ave., Chestnut Hill, Philadelphia 18, Pa., has issued a booklet containing recommendations for the use of the company's pumps, capacity selection tables, a description of automatic volume control, available construction materials, table.

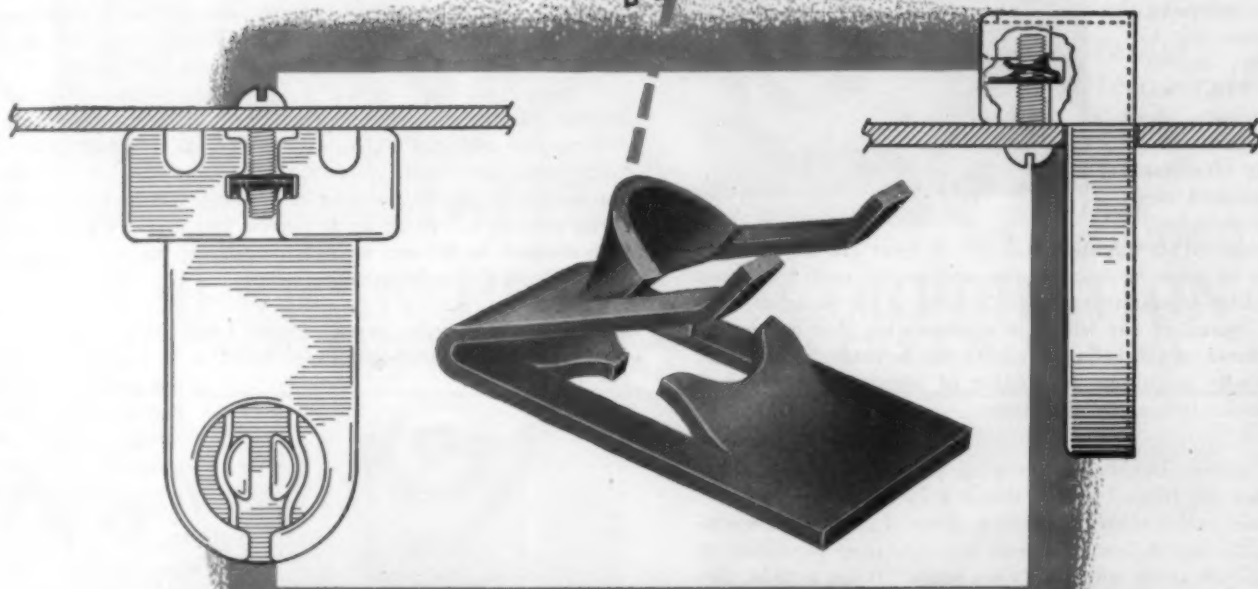
**Toolmaker's lathe**—A four-color, 24-page publication has been received from the Monarch Machine Tool Co., Sidney, Ohio, covering the company's Model EE toolmaker's lathe. Specifications, design and construction features of the 10-in. sensitive precision machine are given, accompanied by a number of illustrations, with views of electrical, mechanical equipment details.

**Chemical prime coat for metals**—TUF-ON P-7 Pri-Met, said to solve the problem of adhesion to such metals as brass, tin, lead and cadmium, is a new specially formulated zinc chromate primer described in a folder received from Brooklyn Varnish Mfg. Co., 50 Jay St., Brooklyn 1, N. Y.

**Buffing and polishing operations, balancing tubes**—Divine Bros. Co., 200 Seward Ave., Utica, N. Y., manufacturers of metal finishing machinery and supplies, announce the publication of two bulletins. The first of these briefly defines buffing and polishing operations and shows a convenient table for estimating surface feet per min. from r.p.m. for wheels from 4 to 24 in. in diameter. The second publication describes the balancing tubes available in Divine Clothflex polishing wheels.

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This SPEED NUT C6800 is zipped into the recess in the lamp socket to stay. The turned up ends of the spring arms "bite" into the plastic to lock the SPEED NUT firmly in place. It is self-locating because the extruded collar butts up against the back of the vertical slot to line up the SPEED NUT impression with the screw hole. It's self-retaining and self-locking because of the

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Why not let us design a fastener for you that can be applied twice as fast and do a lot of other things besides holding the screw. Write for samples or send your engineering details for a no-charge analysis.

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SHAPES AND SIZES

F A S T E S T T H I N G

I N F A S T E N I N G S

JULY • 1947

171

# New Machinery and Equipment

**Electronic sealer**—For one shot bonding of thermoplastic fabrics, RCA Victor Div. of Radio Corp. of America, Camden, N. J., has announced a new type of high-frequency sealing press, the Universal Electronic Sealer.

This sealer can be adjusted to produce any shape of seal by bending or changing a brass strip to fit the desired shape. This is said to eliminate the need for purchasing a variety of expensive machined dies and die shoes ordinarily required for this operation. Seals from 7 to 15 sq. in. in area can be made in one operation and require only 1 to 4 sec. to complete, depending upon the thickness of the materials to be sealed. Seams of any length or configuration that can be accommodated on the 14-in. sq. platen can be made. This sealer is especially useful for fabrication of plastic balls, pouches, pocketbooks, belts and similar items.



**75-ton press**—Denison Engineering Co., 1160 Dublin Road, Columbus 16, Ohio, has introduced a 75-ton Multipress with varied ram action controls. With a choice of three valve combinations this new 4-strain-rod press is said to meet practically all pressing-cycle needs within a 75-ton range. It has a 30-in. daylight opening and 18-in. stroke, automatic or manual ram cycling, low ram tonnage if desired, large tooling area and pressurized filter system. Simple adjustments give it a pressure variance of from 7½ to 75 tons.

**Impact machine**—The Baldwin Locomotive Works, Philadelphia 42, Pa., has announced a Sonntag impact machine adapted for Charpy Izod and tension tests. A slotted and ground base simplifies the use of special fixtures for other tests. Model SI-1p is available for plastics and has a maximum capacity of 48 ft.-lb. Models SI-1a, SI-1b, SI-1c and SI-1d are available for metals with SI-1c having a maximum capacity of 240 ft.-lb. In the plastics model, one hammer serves for all capacities. Medium and high capacities are obtained by the addition of weights. This, together with the use of low and high release, provides five ranges—10, 20, 24, 30 and 48 ft.-lb. A special dial has been developed to permit more accurate reading in these ranges. For the 10 and 24 ft.-lb. capacities, each dial division represents 0.1 ft.-lb.; for the 20, 30 and 48 ft.-lb. capacities, each division represents 0.2 ft.-lb. Span between Charpy anvils is 4 in. instead of 40 mm. as in the metals type machine.

**Abraser accessories**—Taber Instrument Corp., 111 Goundry St., North Tonawanda, N. Y., has announced three new accessories developed for use with the company's abraser in wear-testing a wide range of materials. The first, the Interval Timer, is an electrical attachment which permits operating time of abrasion tests to be controlled within predetermined limits. This is said to eliminate losses of tests and to enable testing executives

to concentrate on other research analyses while the abraser is in operation. Second is the Duplex Refacing Stone designed for periodically refacing Calibrase-type abrading wheels. It provides improved control of wheel surfaces and more dependable standardization of wheels. Third is Abraser Drymount, a dual-coated adhesive sheet that simplifies and speeds preparation of thin, flexible fabrics or other similar materials for wear-testing.

**Marking machine**—National Rubber Stamp Works, Inc., 7 East 48th St., New York City, announces made-to-order marking machines. The hand-operated platen press method is employed and all presses print from rubber dies. The choice of the ink is dependent upon the kind of surface to be marked—metal, plastics, wood, etc. Each press is designed with permanent or adjustable guides and holders to position the product for marking. Any reading matter, insignia, trademarks, etc., reproducible on rubber may be printed. Different colors can be marked simultaneously on different portions of the same product or on different products. Speeds up to several thousand an hour have been claimed on fixtures made for small objects and equipped with multiple dies and supporting arbors.

**Automatic hydraulic press**—Plastic Laminating Corp., Vaux Hall, N. J., has introduced Placo M-50, a 40-ton floor model



automatic laminating press. This machine can be adapted to compression molding by removing the multiple laminating platens. It is said to produce close tolerance work in the compression molding. It is of all steel construction with aluminum laminating platens which are electrically heated with the temperature controlled thermostatically. For the chilling, water may be circulated through the cored platens. The press has a 6-in. ram, 10½ by 12½-in. platens, height of 65 in., width of 26½

in., depth of 25 in., weight 750 lb. and operates on 110 volts AC. Such articles as photos, credit cards, charts, discharge papers, identification cards, etc., may be sealed and given protection against dirt, discoloration, moisture and wear on this machine.

**Expanding insert**—The Dodge Mfg. Co., 48 Leavenworth St., Waterbury, Conn., has announced a Dodge Insert designed for thermosetting and thermoplastic molded parts as well as for several branches of machined or fabricated plastic items. The insert has a full thread to within 1/32 in. of its full depth. A self-

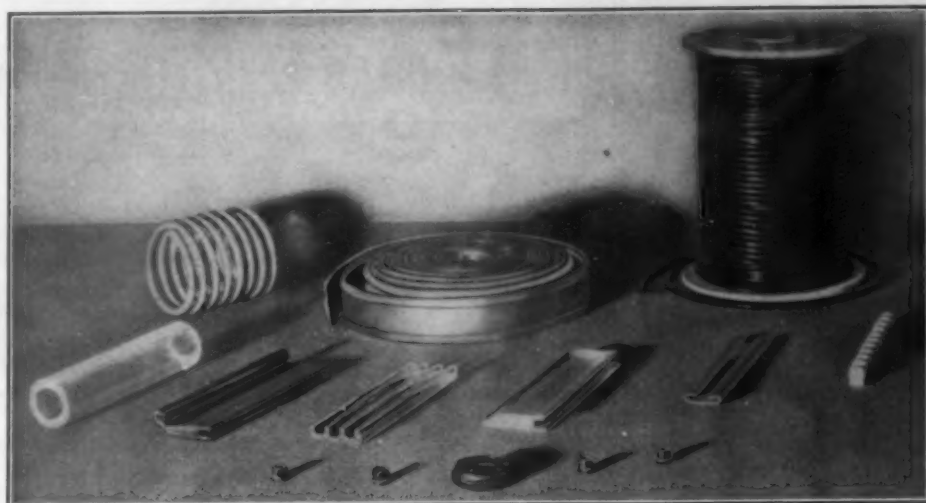
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CHANNELS  
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Acetate  
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Geon  
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Laminating Pressure, p.s.i.	250	1,000	200	75
Moisture Absorption, 24-hr. Immersion, 1/16 Inch				
Thickness, Percent	5.4	6.4	3.2	0.8
Flexural Strength, p.s.i.				
Lengthwise, Flatwise	27,100	20,550	18,800	19,500
Lengthwise, Edgewise	26,800	27,975	21,000	34,450
Tensile Strength, p.s.i.				
Lengthwise	28,600	24,375	13,150	48,550

\* The word "Valite" is the exclusive trademark property of Valite Corporation and application for registration of this trademark is now pending.

## VALITE CORPORATION

400 WEST MADISON STREET  
CHICAGO 6, ILLINOIS

## PHENOPREG GRADES

\* In addition to the many standard Phenopreg (phenolic resin impregnated) and Phenopreg MB (melamine resin impregnated) grades for molding and laminating of decorative and graphic laminates, sheet stock and numerous other applications, we produce a variety of Phenopreg grades for special applications.

Special Phenopreg grades and applications are listed below—

**PHENOPREG X-CREPE**—for all directional stretch molding of compound curves and irregular-shaped parts.

**PHENOPREG RP**—for plywood surfacing applications at 100-150 psi where decorative, abrasion-resistant, smooth, hard surfaces are required, such as wall panels.

**PHENOPREG FOR HONEYCOMB PANELS**—used for the production of low density core structures between metal, wood or laminate faces.

**PHENOPREG FOR FILTER APPLICATIONS**—used as filter media for air, various liquids including oils, medical applications, etc.

**PHENOPREG TUBE WINDING GRADES**—for the production of baked and laminated tube stock for electrical and radio applications.

We invite your inquiries for Phenopreg grades suitable for special applications or end uses.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

**FABRICON PRODUCTS, INC.**

## PLASTICS DIVISION

1721 Pleasant Avenue • River Rouge 18, Michigan

Vineyard LA200

Special types have been developed for each plastic

# Pearl Essence

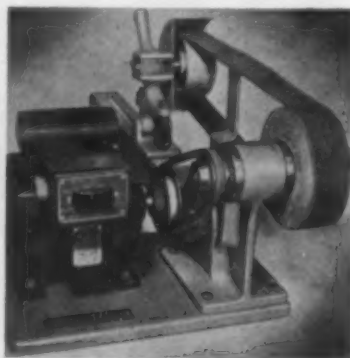


**THE  
MEARL  
CORPORATION**

153 Waverly Place New York, N.Y.

contained unit, it lends itself to automatic feeding. Torque and pull strength are said to be comparable to the usual type insert. For thermosetting materials, it avoids the problems in molding of floating inserts, crushing of inserts, breaking of mold insert pins, flow of material into open hole and blind inserts, height tolerance of protruding inserts, inserts at right angles or oblique position, cracking of material around inserts. In injection molding of thermoplastic materials, it is said to allow the true fast production of automatic injection machine items without limiting these items to those requiring no inserts.


**Utility grinder**—The advantages of grinding on an abrasive belt operating over a resilient contact roll or wheel are offered



in a new utility grinder by Porter-Cable Machine Co., 1714 N. Salina St. Syracuse, N. Y. Since the wear is on the abrasive belt and not on the supporting contact wheel, this wheel or roll is said to remain flat, square at the corner or side and to maintain its diameter and balance. The grinder is adjustable to 90°. For grinding and polishing of certain rounded or oval parts, an additional

formed resilient contact roll can be attached to the grinder in place of the platen. Work is also done on the free or unsupported abrasive belt, such as grinding contours, following a pattern or grinding or cleaning up in otherwise inaccessible places.

**Metal working machine**—Clinton Machine Co. of Clinton, Mich., has announced the Thomas Metal Master, one machine offering eight metal working operations. Using a low voltage, high-ampere current flow to create a high-temperature arc at point of contact, it will cut hardened metals without annealing or affecting the Rockwell hardness of the material. It will quickly disintegrate embedded, broken high-speed tools or studs and screws from workpieces without damage to metal or threads. The arc welding unit will weld most gages of steel, cast iron and other metals. It provides 100 amperes for 30 min. runs, up to 200 amperes for intermittent runs, with 8 heat stages. It uses up to  $\frac{3}{16}$  in. rods. The brazing unit is used for fusion of light metals. Soldering is also possible. Straight broken objects, such as drills, reamers, as well as pins



and plug gages, may also be removed by the drill pulling unit. Where the regular disintegrating head cannot be used, a hand-operated tap extractor, using air, removes broken objects from

# ATKINS

## "Curled-Chip" BUTTRESS BAND SAWS

POINTS  
THAT  
ADD  
UP  
TO

### Superior Plastic Sawing

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On every count—speed, smoothness, versatility, economy—you can count on Atkins Curled-Chip Band Saws for superior plastic cutting.

#### SMOOTH

These unbeatable blades with the unique "Skip Tooth" design bite right into toughest plastics . . . cut cleaner, cooler, longer.

#### VERSATILE

You'll have less finishing to do on plastics cut by the exclusive Curled-Chip method . . . the cut is uniformly glossier and finer.

Profile, contour, curved or cut-off sawing—it's all the same to this remarkable blade . . . it performs with equal efficiency on the most unusual jobs.

#### LOW-COST

You'll save both time and money by standardizing on Atkins Curled-Chip Buttress Bands . . . through increased production, fewer blade changes, faster finishing, lower scrap losses.

Consider your special requirements—then consider Atkins special advantages—they'll "measure up". Write for complete data today.



**E. C. ATKINS AND COMPANY**  
402 South Illinois Street  
Indianapolis 9, Indiana  
Agents and Dealers in all Principal Cities the World Over



### Arnrus the mark of merit in transparent plastic packaging

"View" to sales is through the eye, of course, and that's why the eye catches, from the sparkling transparency of an Arnrus Plastic Container, the full beauty of your product . . . form-fitted . . . and as fresh and new-looking as the day it left the factory.

The experience and facilities of Arnrus, a pioneer in transparent plastic packaging, is your guarantee of the finest custom-made plastic packaging to win retail cooperation and consumer acceptance for increased turnover.

Enjoy a "view" to sales . . . and enjoy it more . . . with the economy and quality of plastic packaging by Arnrus. Write today for information.



IT'S RIGHT IF IT'S **Arnrus**

# Announcing...

A NEW DIVISION OF INDUSTRIAL ABRASIVES, INC.  
the

## INDUSTRIAL PLASTIC CO.

Industrial Abrasives, Inc., which for over 12 years, has served the largest manufacturers in America, announces the opening of the Industrial Plastic Co. This new firm will devote its engineering know-how to products utilized in the industrial field. Write or phone for information.

INDUSTRIAL PLASTIC CO.  
3724 West 38th Street • Chicago 32, Ill.

## PLASTIC MOLDS

25 years experience in designing and building molds for leading molders.

Our plant is modern in equipment for producing the best in molds.

Compression • Injection • Transfer

Now equipped with an eight-ounce injection machine for testing molds



### FORTNEY MFG. CO.

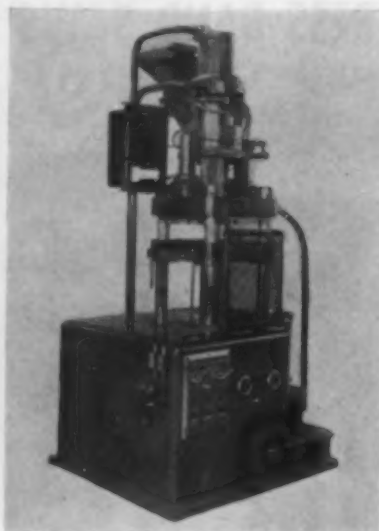
INCORPORATED

247 N. J. R. R. Ave.

Newark 5, N. J.

hard-to-get-at places. Parts numbers, names, etc., may be etched on castings or parts with the etching unit. The eighth unit of this machine is the demagnetizer. Although the Metal Master is a portable unit, it is still capable of holding as much as 1000 lb. of metal.

**Vertical injection molding machine**—De Mattia Machine & Tool Co., Chelsea Rd., Allwood, Clifton, N. J., has recently announced a new vertical injection molding machine. Offered in two capacities, in 4 oz. and 12 oz., the machine is completely hy-



draulic even to the die closing mechanism which, incidentally, has no toggles for clamping. One interesting feature of this machine is the steps and platform which have been designed into the base of the unit to permit easy access to the feed-hopper for loading purposes. The machine is equipped with a proportioning type temperature controller and an indicating pyrometer. This machine may be

quickly converted to standard compression from transfer molding. In the case of compression, the 4-oz. machine becomes a 150-ton compression press; the 12-oz. machine may be converted to a 400-ton compression press. The unit has timing equipment for automatic cycling through one complete cycle, the cycle being started by the closing of the safety gate. Two hydraulic cylinders provide for automatically moving the upper platen away from the nozzle, if this motion is required. Units of this type are especially desirable when injection molding parts require various types of inserts.

**New drying oven**—The Jersey Sheet Metal Products, Inc., 78-84 21st Ave., Paterson 3, N. J., has announced a new plastics drying oven known as Model No. 150.

This machine can handle 225 to 250 lb. of material at one time in its 20 trays. By means of a baffle system, each compartment can be held at separate temperatures. Temperatures up to 800° F. can be attained. Easily removable air filters assure only clean air being circulated within the oven. Attachments with the exhaust may



also be obtained from the company. These attachments serve to run the exhausted air outside of the plant.

**Plunger molding press**—The Baldwin Locomotive Works, Philadelphia, Pa., has developed a line of Hy-Speed plunger



## WEAVING RUGGED BEAUTY INTO LONG-WEARING UPHOLSTERY FABRICS

There's a growing swing toward the new, compelling fabrics that are being woven of SARAN monofilaments in fascinating colors, textures and patterns. For these exciting upholstery materials are rugged enough to take the roughest kind of wear—laugh away dirt, spilled drinks, even acids. In short, furniture upholstered in SARAN fabrics doesn't have to be pampered!

Today's markets hold greatest possibilities for top quality products . . . and manufacturers are finding that these tough SARAN yarns are weaving a selling story that's irresistible.

SARAN BY NATIONAL denotes monofilament, rattan and tape manufactured by The National Plastic Products Company from Saran, a vinylidene chloride copolymer made by The Dow Chemical Company and supplied to mills, weavers and other fabricators for specific end uses.

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*The* **NATIONAL** *Plastic Products Company*  
ODENTON • MARYLAND

## Decorators and Printers



**Creative** — means the finest decoration on your glass, plastic or metal container —

**Creative** — means unlimited production facilities —

**Creative** — means an expert technical staff to solve your printing problem.

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**PRINTMAKERS, INC.**

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**TRANSPARENT  
Plastic  
BOXES...CANS**

- Confections
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- Toys
- Bakery Products
- Plastic Novelties

Hundreds of these and other products are more readily "saleable" packed the Modern, Transparent Way.

Appeal to the "Impulse" buyer as well as the "Shopper." Your product will get the decision twice as often.

**WEINMAN BROTHERS, INC.**

Est. 1919

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CHICAGO 10

molding presses. Using this equipment, thermosetting resins can be forced into a mold and rapidly cured. The presses can be used on such thermosetting plastics as the phenolics and melamines, and are advantageous for molding pieces containing fragile inserts. The presses are available in 50-, 100-, 200- and 300-ton capacities. Specifications for the 300-ton model are: die space 36 by 36 in.; stroke 18 in.; daylight between bolsters 24 in.; pull back capacity 33 tons; motor horsepower 15; operating pressure 2500 p.s.i.; advance speed 202 i.p.m.; pressing speed 14.2 i.p.m.; return speed 127 i.p.m.; capacity, plunger cycle, 80 tons. These presses, along with compression molding, steam platen, die hobbing and custom built presses are described in a company bulletin, No. 251.

**Spiral hopper feeder**—Miskella Infra-Red Co., East 73rd and Grand Ave., Cleveland 4, Ohio, has introduced a new spiral hopper feeder which can be used with any molding machine. This feeder is 8 ft. high and consists of 57 aluminum "pie pans," 6 in. in diameter and  $\frac{1}{8}$  in. thick, welded together to form a spiral approximately 50 ft. in length. Concealed in the base is an electronic vibrator producing twisting vibrations at the rate of 3600 per minute. Material is poured downward into the funnel at the base of the spiral feeder. In a few moments, the granules are up 7 ft., ready to be distributed by gravity to the hopper of a molding machine. Floor space taken up by this unit is 20 by 20 inches. Machine operators can control speed of feeding by turning a knob. The electrical connection for the spiral feeder is made directly to the molding machine circuit so that operation simultaneously interrupts the flow when the molding machine stops.



**Polishing lathes**—Model 400, the first model in a new line of Amico polishing lathes for jewelers, plastic manufacturers, platers, foundries, tool rooms and laboratories has been introduced on a nationwide scale exclusively through the distributing agency of Ralph Hochman & Co., 52 Edison Pl., Newark, N. J. Model 400 is the forerunner of a quintet of polishing lathes to be known under the trade name of Washed Air and to be manufactured by the American Machine Instrument Co., Newark, N. J.

The machine is equipped with a self-contained dust collecting unit and ball bearing 1725 r.p.m. motors of various sizes from  $\frac{1}{3}$  to 3 hp. of standard current characteristics. These motors operate both the polishing head and dust collecting units. "A"-type line belting is used. Dust is drawn from the surface of the machine by a 4-in. duct in each collector. A removable receptacle on the intake side of the exhaust fan traps any foreign object and prevents it being drawn into the system. The dust-laden air is cleansed by being passed through water and is returned to the workroom through three louvers located in each side of the collector.

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WITH A DRIVER?  
No!**

When you're on the green, a putter and putting stance are "essentials" for holing out . . . and experience is equally essential for consistent results. In the creation of essential papers for industry, MOSINEE paper technicians concern themselves with the job you want paper to perform for your product . . . and the technique of your processing. Through years of successful experience in controls of maximum-minimum pH, uniform specified density, high tensile strength, specified dielectric strength, moisture repellency and other vital paper characteristics, MOSINEE consistently gets results that improve products and processing. That's why many manufacturers rely on MOSINEE as a dependable source for industrial papers.



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*Essential Paper Makers*

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## Attention MANUFACTURERS—FABRICATORS!

### Special Offering

#### TUBING — TULOX TT

1/4" O.D. x 3/16" I.D. x 12 ft. lengths

200 lbs. Black - 250 lbs. White

\$1.00 per lb.

Tenite II - 5/8" x 1/2" x 12 ft. lengths

250 lbs. Black - 250 lbs. White \$1.00 per lb.

#### DISTRIBUTORS OF SCHWARTZ CHEMICAL

Rez-N-Bond, Rez-N-Glue, Rez-N-Dye

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YOURS FOR **PLASTIC MOLDS** OF PRECISION!

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# Butt<sub>o</sub>ndex CORPORATION

"Your Problem is Our Product" • 386 Fourth Ave., New York, N.Y.

## Letters

*This letters section, which will appear each month, is devoted to excerpts from letters that seem, to the editors, to be of significance to the entire industry*

### Merchandising that clicks

Sir:

Because of the recession that has taken place in the plastics industry, Lester-Phoenix, Inc., has decided to make a radical change in their method of advertising. It is apparent that the industry has considerable plant capacity which is not being utilized at the present time and this condition will not change until more business is procured.

The company has decided to devote all plastics advertising for the next three months to an effort to change this condition through getting actual inquiries for Lester-Phoenix customers who may have production time available on their equipment. This decision was motivated by two things: first, our client's knowledge of what is going on in the molded part of the industry, and second, on merchandising your articles in the May issue which crystallized our thinking along these lines.

HOWARD N. FINDLEY

Gregory & House, Inc. (Advertising)  
Cleveland, Ohio

*Lester-Phoenix is to be highly congratulated on a forward step—the first of its kind that we have heard of to date in the plastics industry.*

### They'll listen if you'll tell 'em

Sir:

As a salesman for a plastics company I hear many complaints concerning plastics as a whole, but I hear of no one trying to counteract the criticisms. As a toastmaster I had an opportunity to answer these complaints and was amazed to find the favorable reaction to my remarks. One concrete result was to sweep away the predominant thought that plastics was a novelty material and not usable in hot water. If some agency could send speakers to reach into organizations in touch with the public, it would be doing the plastics industry a great service.

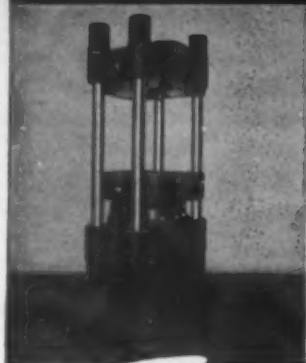
C. J. KLINER

St. Paul, Minn.

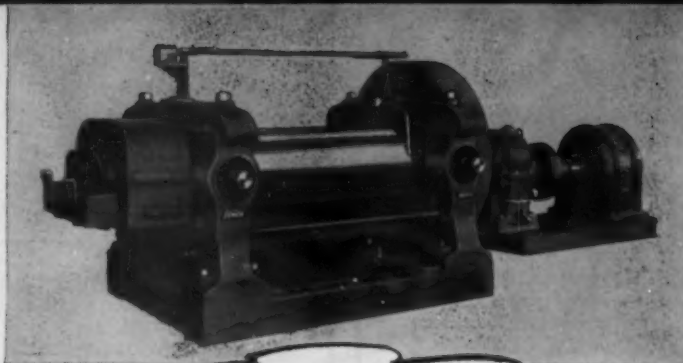
*The counteracting of criticism of this type is a public relations job and should properly be the work of such organizations as the Society of the Plastics Industry, the Society of Plastics Engineers and the Plastics Materials Manufacturers Association.*

*(Please turn to next page)*

## RUBBER & PLASTICS PROCESSING MACHINERY



PRESSES



HEAVY DUTY MILLS



LABORATORY MILLS

### Sales Representatives

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DUGAN & CAMPBELL  
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AKRON, OHIO.

EASTERN  
H. E. STONE SUPPLY CO.  
OAKLYN, N. J.

MIDWEST  
HERRON & MEYER OF CHICAGO  
38 South Dearborn Street  
CHICAGO 3, ILL.

MILLS • PRESSES • TUBERS  
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WASHERS • CRACKERS  
CALENDERS • REFINERS

Three outstanding features are found in EEMCO Rubber and Plastics Processing Machinery. First, Correct Design; second, Sturdy Dependability; third, Built for Heavy Duty and Long Life with minimum repairs. Mills, Crackers, Refiners and Washers are furnished as single units, or for operation "in line" of two or more.

EEMCO Presses are made from 12" x 12" for Laboratory use up to sizes to meet all requirements. The New EEMCO Laboratory Mill (illustrated) is a fully enclosed, self-contained unit with variable speed drive. Streamlined, it is ideal for Laboratory and Small Production. Bulletins sent on request. Write today for quotations & delivery.

# EEMCO

## ERIE ENGINE & MFG. Co.

953 EAST 12th ST., ERIE, PENNA.

**HANG UP YOUR COAT**  
—and let's get to work  
Keeping costs down...turning out quality  
work—that's the order of the day! Here  
—at Ideal—we have the "know how" and  
the facilities to do both!

Whether it's a clothes hanger or a buckle  
or a lipstick holder, our engineers and  
molders are trained to help you from  
drawing board to finished product.



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If you are looking for fine, accurate  
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### Complete Service!

We offer complete service in custom thermoplastic work— injection and extrusion molding, product design, mold design and construction, finishing and assembly. Specialists in SARAN. Write us TODAY!

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**We'll dye for you!**

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PLASTIC DYES

#### REDUCE YOUR INVENTORY

Carry one stock color. . . . . We'll dye for you!

#### STOP PRODUCTION LOSSES

Use off-shade runs. . . . . We'll analyze your needs!

#### SIMPLIFY PROCUREMENT

Stock always available. . . . . We'll process your products!

**ADD SALEABILITY TO YOUR PRODUCTS**—12 Standard jewel-like colors or combinations make the color range unlimited. Colors are infused without altering original finish or lustre. Or, if you prefer to do your own dyeing, Gypsy Cold, Dip Dyes are available with complete, simple instructions.

**New! Gypsy Plastic Cement**—Non-inflammable, non-explosive. Twelve standard colors, combinations and clear. Moderate setting speed permits "working" with materials to be welded.

**Free Trial!**

We'll prove Gypsy Plastic Dyeing is beautiful and practical. Send sample of plastic material and the color desired. We'll dye it and include a sample of Gypsy Plastic Cement to match. No obligation.

● **GYPSY DYES, INC.** Division of Wittie Mfg. & Sales Co.,  
1414 S. Wabash Ave. • Chicago 5, Ill.

### Wants a plastic tank for acids

Sir:

It is my belief that there are many potential uses for plastics which have yet to be investigated. I, for one, have been interested in an acid transport tank to be used on trucks. It could be light weight, non-corrosive and a distinct improvement over steel. There are thousands of tanks used on trucks for various purposes. All of them are steel and this means much dead weight. Industry is always looking for something better. Plastics have made a start but there is a big field yet, especially for larger sized articles and equipment.

C. E. CLASON

Halliburton Oil Well Cementing Co.  
Duncan, Okla.

### Plenty of talk but no action

Sir:

The entire country is now undergoing an industrial metamorphosis from a producer's to a buyer's market. Many firms have so abused plastics that the market for consumer goods has been seriously affected. Consumers only remember that they were willing to pay more for a better product which, in many instances, did not live up to their expectations. They are now reluctant to purchase anything made of plastic. This is primarily true and possible only because advanced media of merchandising, and, more important, the honest presentation of the truth relevant to the items in question have never been forwarded to the consumer. I have discussed this question with people in the industry and found an admission that something had to be done but nothing concrete had been attempted or even advanced. The many conflicting interests should be amalgamated toward the unified interest of all.

OSCAR SCHACHTER  
New York, N. Y.

### Try something new on something old

Sir:

With reference to your article "Economics of Low Pressure Plastics" in the April MODERN PLASTICS, I feel that the low pressure subject is on the threshold of great development and exploitation and will take on a rapid pace. The industry has had comparatively little to develop, refine or perfect that has not already been done in other fields with other materials. In a very substantial way all we have to do is use our imagination, resourcefulness and knowledge and "borrow," which we can do for the mere asking, many of the practices and procedures now employed with other materials which fit into development of the low pressure business. For example we are actively engaged in the adaptation of a felt hat forming machine from Fiberglas and plastic which will require some modest change or alteration, but the techniques and practices we will employ are substantially the same as those already developed.

J. S. IRVINE  
Fiberglas Corp.  
New York, N. Y.

# AN IMPORTANT ANNOUNCEMENT

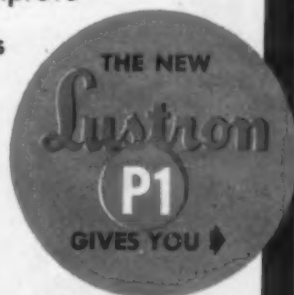
ABOUT

# Lustron

## P1

MONSANTO'S IMPROVED POLYSTYRENE

It's here now . . . the better, faster molding polystyrene! Lustron P1 comes to you as an even further development and improvement of Monsanto's popular Lustron. Molding cycles are speeded . . . temperatures and pressures reduced . . . all-around moldability improved . . . with no loss in any of the outstanding physical properties of Lustron, or any increase in price.



**1 Reduced molding cycles**—On certain jobs running near the capacity of the machine, the cycle has actually been cut 10% to 20%.

**2 Lower pressures and temperatures**—Greater plasticization permits the use of reduced temperatures and pressures in molding.

**3 No burning**—Lower temperatures practically eliminate burning.

**4 Improved weld lines**—As a result of better plasticization and flow, weld lines are stronger and less apparent.

**5 Improved gloss**

**6 Improved mold release**

**7 Same low cost as Lustron**



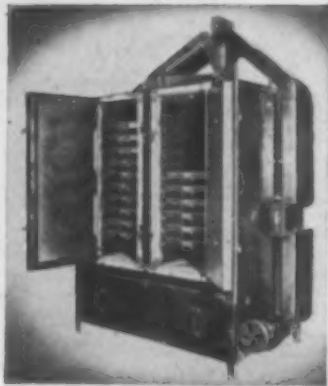
and all these advantages are offered to you, in addition to Lustron's already established superiority of dimensional stability, light weight, full color range, chemical and moisture resistance, excellent electrical properties and freedom from taste and odor.

When you use Lustron P1, you'll be sure it's the best in polystyrene! MONSANTO CHEMICAL COMPANY, Plastics Division, Springfield 2, Massachusetts. Lustron: Reg. U. S. Pat. Off.

SERVING INDUSTRY . . . WHICH SERVES MANKIND

## Save Time and Cut Costs With This Double-Section Preheater

This one preheater with two sections does the work of two individual preheaters. Its two sections can each be operated at a different temperature by means of the bafflers between the sections. This allows you to handle the requirements of two different jobs at the same time, thus speeding your operations and cutting costs. Total capacity of oven equals capacity of six 8-ounce injection molding presses. Air filters, easily removable for cleaning, keep circulating air free from dust at all times.



*Baffles can be closed to maintain separate temperatures or opened to permit one over-all temperature.*

Write or telephone for full information.

**JERSEY SHEET METAL PRODUCTS, Inc.**

78-84 21st Avenue,

Paterson, N. J.

Sherwood 2-8174

## AMAZINGLY ECONOMICAL! CONCENTRATE POWDER DYES

### FULL RANGE OF COLORS

Just briefly tumble the dye in the powders and you have your color. The more the dye the darker the color.

$\frac{1}{10}\%$  to 1% by weight colors phenolic casting resins (Marblette), acetate, polystyrene, methacrylate and other injection molding or extrusion powders.

Each plastic calls for one special dye. Specify application when inquiring for trial bottle. . . . \$1.00

**SCHWARTZ CHEMICAL CO.**

INCORPORATED

326-328 West 70th St.

New York 23, N. Y.

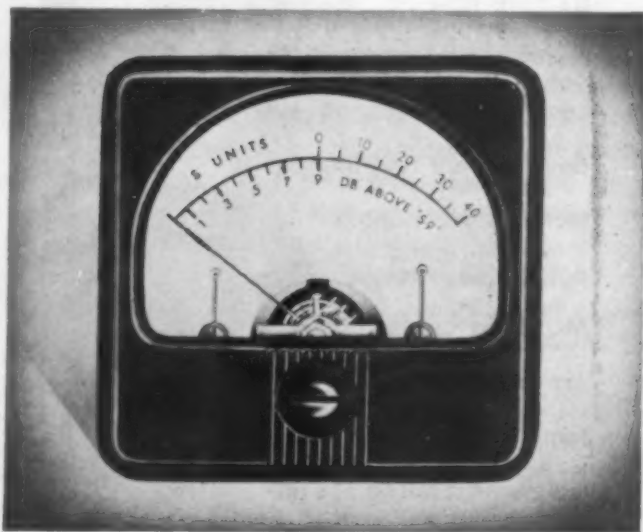
Inquire about our special powder dye which when added to water and heated will color your plastics in the same efficient manner as our famous REZ-N-DYE.

## Acrylic aids lighting

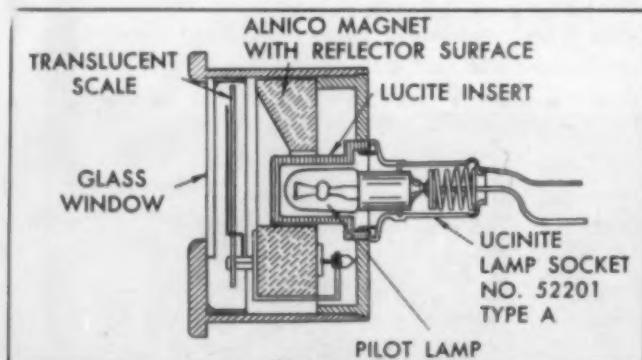
**T**WO BUGABOOS, entrance of foreign matter and use of oversize replacement bulbs, in dial-illuminated panel-type instruments have been eliminated by Marion Electrical Instrument Co., Manchester, N. H., through a new design incorporating Lucite.

A transparent acrylic cavity in the design is utilized to seal off the aperture in the back of the meter where bulbs are inserted. This prevents thermal currents from sucking foreign matter into the mechanism. At the same time, the cavity controls size of bulbs that are inserted.

A new Alnico magnet, whose front face is shaped somewhat like a flashlight reflector, assures even and brilliant illumination across the dial face. This new design is applicable to the company's  $2\frac{1}{2}$ - and  $3\frac{1}{2}$ -in. round and square instruments,  $4\frac{1}{2}$ -in. rectangular instrument and Model 52S tuning meter.



*Above—Damage to dial-illuminated instrument is reduced by use of acrylic cavity to seal off section holding bulb*



*Above—The position of the transparent acrylic cavity in relation to rest of inner parts is shown in this drawing*

# AROMATIC DISTILLATES

- High-boiling aromatic hydrocarbons consisting largely of unsaturated polymers recovered in the distillation of petroleum
- Economical especially where color is not important
- Available in three boiling ranges
- Suggested for use in low-cost paints and varnishes, printing inks, core oils, bituminous paints, saturating asphalts, flotation oils and as soil sterilizers
- Supplies practically unlimited

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**ENJAY COMPANY, INC.** *(Formerly Standard Alcohol Company)*

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**ACCURATE** MOLDING CORPORATION 35-20 48th AVENUE LONG ISLAND CITY 1, N. Y.

# News of the Industry

**Durez Plastics & Chemicals, Inc.**, of North Tonawanda, N. Y., has just announced a new resin adhesive, known as Durez 13793 for assembly or secondary gluing, which sets at room temperature and has a 1-hr. assembly time. This water-soluble resorcinol-type liquid resin which has more than six months storage life in sealed containers, is used for gluing sheet asbestos, foamed glass, phenolic laminates, etc.

**The Plaskon Div., Libbey-Owens Ford Glass Co.**, 2112 Sylvan Ave., Toledo 6, Ohio, has announced that construction of the new plant is according to schedule. The new plant will permit the greatly increased production of Plaskon molding material, coating resins, glues and industrial resins.

**The Bakelite Co. (Canada) Ltd.**, Toronto, Ontario, has purchased a 70-acre plant site near Belleville, Ontario. Here the company plans to construct an 86,000-sq. ft. plant for the production of Bakelite phenolic and urea plastics and resins.

**United States Plywood Corp.**, 55 W. 44th St., New York City, expects its new plant at Portland, Ore., to be in operation by the first of August. High-grade synthetic resins, principally the phenol-formaldehydes, will be produced at this plant.

**The Sugar Research Foundation, Inc.**, 52 Wall St., New York City, has developed a heat and chemical resistant varnish-like material, allyl sucrose. The coating withstands temperatures up to 400° F. so that wood under the varnish is said to char before the coating is marred.

**General Electric Co.** has begun operations in their newly constructed Anaheim, Calif., plant for the manufacture of Glyptal alkyd resins, basic ingredients for paints, enamels and other surface finishings. Company officials said that the new plant, a unit of the G-E Chemical Dept., has been established better to supply the increasing number of users of Glyptal on the west coast and in the Orient.

**United States Rubber Co.**, Rockefeller Center, New York City, is now offering a plastic material with patent finish for the first time in continuous lengths 54 in. wide. Called Patent Finish Naugahyde, it can be used for upholstery, luggage, handbags and paneling.

The company also has announced plans to expand wire-production facilities in the Bristol, R. I., plant. More than a million dollars worth of rubber and plastic insulating equipment will be purchased to increase the plant's capacity to three times its pre-war output. The new machinery is designed for insulating wire by the company's patented Laytex dipping process.

**Advance Solvents & Chemical Corp.**, 245 Fifth Ave., New York City, has announced a relatively non-volatile plasticizer, Plastoflex #5, for polyvinyl chloride, polyvinyl chloride-acetate, polyvinyl butyral, nitrocellulose, polystyrene and acrylic polymers. It also has some compatibility with cellulose esters. The plasticizer gives tough, leathery compositions. At high temperatures, such as are used in milling and calendaring vinyl resins, it is said to have excellent hot strength and does not become short on the calender.

**The Plastics Div. of Monsanto Chemical Co.**, Springfield, Mass., has announced a new and improved polystyrene which is said to withstand scalding temperatures and actual boiling for

short periods of time. The material, to be marketed as Lustrex is not a copolymer. It is said to have excellent moldability in standard injection and extrusion machines. A complete article on the properties and uses of this material will appear in a forthcoming issue of MODERN PLASTICS Magazine.

The company has also announced Lustron PI, a polystyrene molding material with improved molding properties. Molding cycle reductions of 10 to 20 percent are said to be possible. According to the company, molding pressures ranging up to 20 percent less than those used for standard polystyrene can be utilized while molding temperatures can be cut as much as 30 percent.

**Pennsylvania Plastics Corp.**, 808 Penn Ave., Pittsburgh, Pa., is now engaged in cold die-cutting of acrylic up to  $\frac{3}{16}$  in. in thickness, using hardened steel rule dies fastened to steel plates and cutting onto soft steel.

**Enthone, Inc.**, 442 Elm St., New Haven, Conn., has announced the development of a new stripper, Enthone Enamel Stripper S-300 for removal of many types of organic coatings. Synthetic enamels such as alkyds, melamine and urea-formaldehyde coatings are readily stripped with this stripper. It can be used full strength at room temperature or diluted with water and heated in the temperature range of 150 to 180° F. Enamels are said to be removed cleanly by a wrinkling action leaving the work bright and clean. There is no attack upon base metal.

**Andover Kent Aviation Corp.'s Plastics Div.** plant and processes plant have merged with the facilities of the **Rodie Rubber Corp.** of New Brunswick, N. J., a wholly owned subsidiary.

**Bakelite Corp.**, 300 Madison Ave., New York 17, N. Y., has announced that effective June 2, prices on quantity lots of Bakelite polyethylene were reduced from 53 cents to 49 cents per lb. and colored compounds based on this resin from 63 cents to 56 cents per pound. This reduction is made possible by the steadily increasing production and use of these plastics.

**Union Oil Co. of California**, Union Oil Bldg., Los Angeles, Calif., has introduced Uniperox 60, a liquid hydroperoxide catalyst which can be used in the manufacture of vinyl type plastics, polystyrene, acrylates, GR-S rubber and for the curing of special resin monomers. Uniperox is a clear liquid, slightly soluble in water but completely miscible with most organic solvents, petroleum products and resin monomers. The oxygen content of different grades varies between 7.5 and 12 percent. It can be kept over a year without appreciable decomposition.

**Aceto Chemical Co.**, 11 W. 42nd St., New York City, has been organized by Arnold J. Frankel. The company will act as manufacturers consultants on plastic marketing and manufacturing problems, and is formulating plans for its own manufacture of plastic raw materials.

**The Plastics Div. of Ranger-Tennere, Inc.**, has moved from 450 W. 31st St., New York City, to new and enlarged quarters at 318 E. 32nd Street.

**Wilmington Chemical Corp.**, 10 E. 40th St., New York City, is now distributing three new glass fabrics manufactured by Modigliani Glass Fibers, Inc. Modigliani flexible glass fabric is a firmly bonded unwoven pliable glass fiber fabric in sheet form. It is useful wherever fiber reinforcement of resins is required;

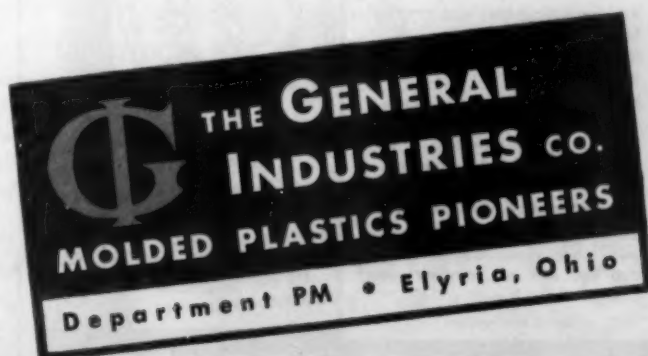


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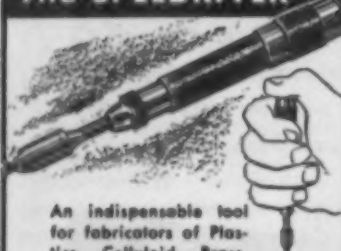
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Goodyear Tire & Rubber Co., Inc., Akron, Ohio, has taken initial steps to increase the company's vinyl plastics production with the starting of operations at Pathfinder Chemical Corp., a new subsidiary at Niagara Falls, N. Y. The plant consists of five processing buildings. Acetylene gas and hydrogen chloride are used to make vinyl chloride by a special catalytic process.

Lus-Trus Extruded Plastics, Inc., 200 Hill St., Ann Arbor, Mich., which was organized last July, is now in production extruding Lus-Trus Saran monofilament in a variety of colors and sizes for textile mills, manufacturers of fishing tackle, etc. R. J. Swanson is general manager.

The Industrial Processing Div. of Magnus Chemical Co., Garwood, N. J., has developed a new technique for the application of diamond grit to the full range of finishing operations where this polishing medium should be used. This technique utilizes colored, pre-mixed diamond compounds available in tube or stick form. The compounds are supplied in eight particle sizes from approximately 120 microns for extra coarse cutting to approximately 1 micron for super high micro finishing. Using this new technique, the life of carbide or steel cutting tools is said to be increased 3 to 6 times and any shaped molds and cavities for steel, plastic, glass, etc., are quickly mirror finished.

The Resyn Dept., National Adhesives Div. of National Starch Products Inc., 270 Madison Ave., New York City, has announced Resyn Adhesive 2632 for bonding of vinyl to vinyl. Vinyl acetate, butyral, chloride and acetate-chloride sheetings or other stocks coated with these materials can all be bonded with this adhesive, according to field test results. Maximum strength of the bond is obtained after 48 hours. The adhesive is a fluid, solvent type, ready for use as supplied and suitable for hand application.

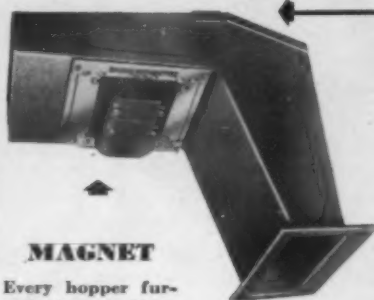
S. Matzner Co., Mount Vernon, N. Y., has developed a method of fabrication by which acrylic lamps, tables and novelties may be decorated with sealed-in strips of ribbon, metal, leather, etc. Patent is pending for this method known as Lubrite. It offers freedom in decoration since furnishings may be trimmed with any desired material to match a room's color scheme. Because the trimming is protected, it will not corrode and need never be cleaned. The method involves the routing out of a strip of plastic from the reverse side of the piece to be decorated. After the trimming is inserted, it is backed with another strip of acrylic that the company extrudes to exact proportions. This strip is fitted in and sealed with cement.

The Solvay Process Co., a subsidiary of Allied Chemical & Dye Corp., at 40 Rector St., New York City, is installing facilities at their South Point, Ohio, plant for the production of methanol, a raw material used in the manufacture of anti-freeze mixtures, plastics and other products.

**Sorry!**

On page 109 of the June issue, the name of Acryliform Plastics Corp. was given incorrectly. The fabricating firm is located at 902 McCarter Highway, Newark, N. J.

(For additional news turn to next page)

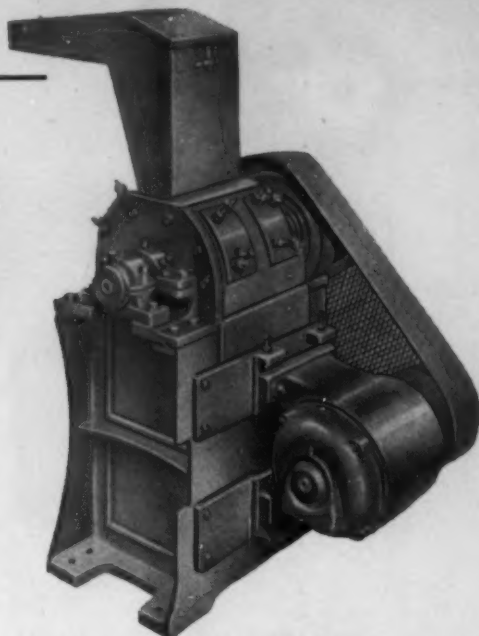


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Plastics as fabrics were represented by only a sprinkling of exhibitors at the **International Exposition of Textiles** in June, but the impact of plastics and synthetics on the textile industry was everywhere evident.

On the one hand there were the appurtenances for textiles such as nylon zippers colored to match various fabrics, plastic buttons, sequins and clothes hangers, vinyl inks and other accessories of the industry. Then there was evidence of the increasing use of textile treating resins and cellulose to improve finish and prevent creasing or shrinkage although it was apparent that chemical and mechanical treatments have by no means given up the sponge to resin treatment. A novelty among the exhibits was a new process for developing a photograph directly on fabric. It is thought possible that this process may be successfully attempted on plastics but nothing has been announced to date.

Interesting publicity accompanying the Exhibition was a photograph of Carbide & Carbon Chemical Corp.'s long looked for fabric Vinyon N, based on a copolymer of vinyl chloride and acrylonitrile which, it is anticipated, will soon find a market in hosiery, tape for insulation, tent fabrics, netting, surgical sutures.

## Personnel changes

Retirement of Charles F. Kettering from his post as chief of General Motors Research Laboratories is of more than passing interest to the plastics industry. In addition to his great interest in plastics as a material for the automotive industry, he has also served as a member of the Hyatt Award Committee. Mr. Kettering will be succeeded in his General Motors post by Charles L. McCuen who has been in charge of the corporation's engineering staff since 1940.

Kenneth H. Klipstein has been appointed assistant general manager in charge of the Development Dept. for the Calco Chemical Div., of American Cyanamid Co., Bound Brook, N. J. V. E. Atkins is now manager of manufacturing, L. M. Phelps will assume the post of plant production manager, formerly held by Mr. Atkins, Ames B. Hetttrick has been named assistant manager of manufacturing and F. W. Zipf is now assistant to the manager of production.

Daniel S. Dinsmoor, vice-president of Monsanto Chemical Co., St. Louis, Mo., and general manager of the company's Merrimac Div., has submitted his resignation to enter the chemical consulting profession. He will be succeeded as general manager by Josiah B. Rutter, now director of the General Engineering Department. Fred G. Gronemeyer will replace Mr. Rutter as director.

Albert W. Dunning has been appointed sales manager of the newly created Industrial and Surface Coating Resins Department. Other appointments include: J. M. Graham, Jr., manager of the Process Section of the General Engineering Dept.; H. T. Gammon, manager of the Project Analysis Section of the General Engineering Dept.; Ivan V. Wilson, assistant director of research, Merrimac Div.; Richard M. Lawrence, staff of the Development Dept.; Stanley L. King, head of newly formed Vinyl Resins Sales Dept., and James C. Brunner, assistant sales manager, Packaging Materials Sales Department.

Dr. Charles A. Thomas, vice-president and technical director of the company, was elected executive vice-president at a recent board of directors, meeting.

Frederick W. McIntyre, Jr., and Charles H. Carswell were elected to the board of directors of the Reed-Prentice Corp., Worcester, Mass., at the annual meeting of stockholders. Donald H. Dalbeck was re-elected treasurer.

William J. Bergin has been appointed sales manager of Carter Products Corp., 10225 Meech Ave., Cleveland 5, Ohio.

(For additional news turn to next page)

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Dr. R. H. Lester has been placed in charge of the work of the Plastics Section of the Floor Products Research Group, Armstrong Cork Co., Lancaster, Pa.

Arthur R. Tinnerholm, Earl W. Llewellyn and Stephen T. Miles make up the board of directors for Specialty Insulation Mfg. Co., Inc., and Colasta Co., Inc., both of 55 Center St., Hoosick Falls, N. Y. They were elected at an annual stockholders meeting. The directors, in turn, elected and appointed the following officers: **Emma J. Bateholts**, Mr. Tinnerholm, Mr. Llewellyn and Mr. Miles, vice-presidents; **John A. Brady**, treasurer; **Helen E. Freeman**, assistant treasurer; Mr. Tinnerholm, secretary; **Arvilla E. Brown**, assistant secretary. Mr. Brady was appointed attorney for both corporations. **Charles J. Quillman**, sales manager of the Specialty Insulation Mfg. Co., Inc., will continue in this capacity.

**Ellsworth T. Candee** has been named director of research and development for the Lea Mfg. Co., Waterbury, Conn., manufacturers of burring, polishing and buffing compounds and developers of finishing methods.

**Gustave Klinkenstein**, vice-president and general manager of Maas & Waldstein Co. and Smith-Davis Paint Co., has been elected president of the New York Paint, Varnish & Lacquer Association for the year 1947.

**Dr. C. W. Walton**, research chemist with Goodyear Tire & Rubber Co. for 14 years, has become assistant to **R. P. Carlton**, vice-president of Minnesota Mining & Mfg. Co., St. Paul, Minn.

## Meetings

The Royal Swedish Academy of Engineering and Science and the Association of Technical Physicists held a joint meeting at Stockholm, Sweden, on June 7. **Henry M. Schmitt**, chemical industry manager for Brown Instrument Co., discussed automatic chemical process control.

The Northwestern Pennsylvania Section of S.P.E. heard **Dr. R. G. Fordyce**, Central Research Dept. of Monsanto Chemical Co., talk on "Trends in functional utilizations of plastics" at a meeting held May 15 at Carver Hotel in Warren, Pa.

The Cleveland Section of S.P.E. met at Smith's Restaurant in Cleveland on May 23. **Julian C. Kazimier**, sales manager of the Amos Molded Plastics, Edinburg, Ind., talked on "The desirability of engineering knowledge for plastics salesmen" and **M. P. O'Dell**, manager of the Instrument Dept., Brush Development Co., Cleveland, Ohio, on "Surface analyzer."

The Mid-Continent Section of S.P.E. was organized recently at Kansas City, Mo. Officers are: **Ernest Bernard** of Lami-Cast Plastics, president; **Barton L. Batty** of 4424 Mill Creek Pkwy., Kansas City, vice-president; **James G. Harper**, Holiday Plastics, Inc., secretary-treasurer; **W. C. Schlager** of Regal Plastic Co., Brook Beatty of Beatty Plastics Co., **James D. Tribble** of Howard Plastics, Inc., **D. M. Kitterman** of National Products Co., **N. L. Spelman** of the Spelman Co. and **Thomas J. Loberg** of Wayne Porter & Staff, directors.

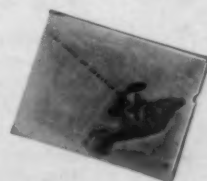
The Philadelphia Section of S.P.E. met at Franklin Institute on May 19. **Gerould Allyn**, Resinous Products & Chemical Co., talked on "Synthetic resins in modern protective coatings." A new **Rohm & Haas Co.** film, "Looking ahead through Plexiglas" was also shown.



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**JULY • 1947**

**193**

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## Belt display boxes

THE history of the Hickok Manufacturing Co. belt display boxes, molded by Boonton Molding Co. of Boonton, N. J., is told in the accompanying illustration. The belt manufacturer, wanting an attractive, practical display box that would also have reuse value, first employed the plastic box at the left. After merchandising experimentation and several interim boxes, the company settled on the box at the right of picture.

The first square phenolic box, in black or brown, had a handsome masculine appearance, but its breakage factor and the fact that it was not visible at a distance caused its redesign.

This time the box was made in cellulose acetate, formed in a rectangular shape, and the decorative horse heads were sprayed with a contrasting color. These innovations improved the attractiveness of the box, in-



*Belt boxes made of phenolic, cellulose acetate and transparent polystyrene show evolutionary stages of the boxes*

creased its visibility, cut down on breakage and offered a greater reuse value. However, since the primary purpose of the box was to sell belts, the company decided to make the box of a transparent polystyrene.

As anticipated, the sale of belts rose, showing that the company was on the right track. Just one more improvement was found advisable—making the bottom of the box opaque to display the belt infinitely better. The unevenness of the cover design was deliberate in order to discourage stores from piling the boxes one on top of the other, giving a poor display effect. All in all, the end result of this merchandising experimentation resulted in a very satisfactory display box.

Two 2-cavity injection molds, run in an 8-oz. Reed-Prentice press are used in the molding of the polystyrene box. The acetate box was molded on similar equipment and the woodflour filled phenolic box was turned out from an 8-cavity combination mold.



**CREATIVE  
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and  
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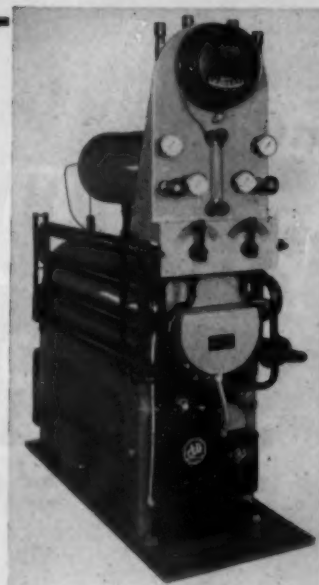
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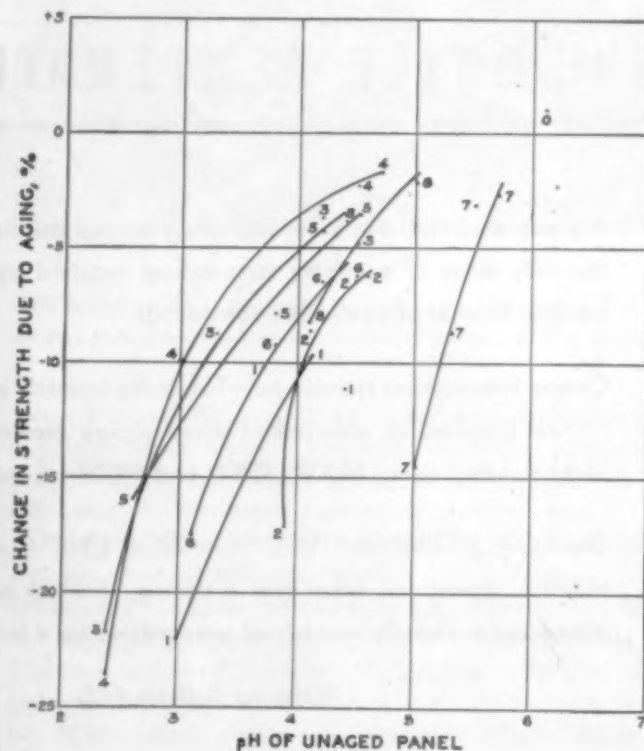
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## Effect of catalysts

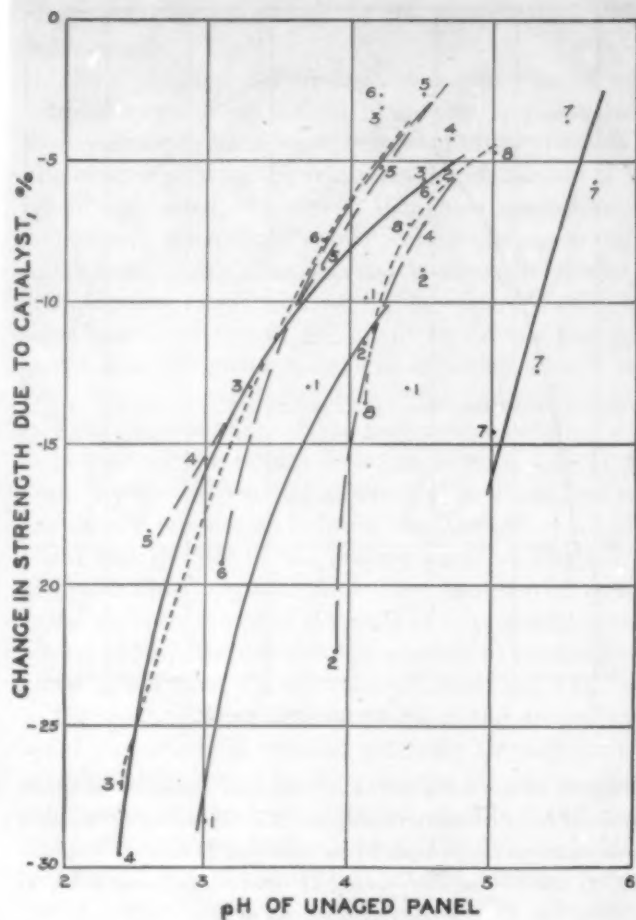
(Continued from page 128) ation of the wood and deterioration of the resin.

**Phenolic resins**—An examination of the values for the flexural, impact and shear strengths of the phenolic resin-bonded panels showed that the presence of acid catalyst causes a decrease in these properties in the unaged panels in every case. No failure of the phenolic resin-bonded composites occurred in the delamination test. The unaged and laboratory aged specimens with pH values of 3.1 or less were brittle in the final flexibility test on the 4-in. mandrel. With one exception, those with pH values of 3.6 or more were flexible.

**Other resins**—The remaining adhesives tested, which included resorcinol, furane, casein and unsaturated polyester types, produced panels of pH 3.2 or greater, with the exception of the furane resin panel which had a pH of 2.2. These adhesives did not undergo marked deterioration in strength when subjected to the laboratory aging tests. The pronounced reduction in strength, which occurred under roof-aging conditions, is attributable mainly to deterioration of the uncoated wood. However, the strengths of the roof-aged panels made with these resins were markedly inferior to those of the roof-aged panel made with the best phenol-formaldehyde resins. It is significant that in the roof-aging tests conducted as part of this investigation, only



7—Effect of oven-fog-aging on flexural strength of birch plywood bonded with Penacolite G-1131, using various acid catalysts. Sample) no acid, 1) hydrochloric acid, 2) nitric acid, 3) sulfuric acid, 4) phosphoric acid, 5) hypophosphorous acid, 6) benzenesulfonic acid, 7) trichloroacetic acid, 8) nitranilic acid



8—Effect of various acid catalysts on flexural strength of oven-fog-aged birch plywood bonded with Penacolite G-1131. Sample 1) hydrochloric acid, 2) nitric acid, 3) sulfuric acid, 4) phosphoric acid, 5) hypophosphorous acid, 6) benzenesulfonic acid, 7) trichloroacetic acid, 8) nitranilic acid

in the case of the casein and some urea-formaldehyde glues had the breakdown at the bond progressed sufficiently to make tests on roof-aged panels impossible.

#### Effect of acidic and basic catalysts

The outstanding feature of the experiments in which various acids and alkalis were added to the resorcinol-formaldehyde and phenol-formaldehyde resins (Figs. 2 through 5, pages 125-127) was their apparent absorption by the resin. Though relatively large amounts of catalysts were added to produce resin solutions of low pH, the resin films and plywood panels had pH values considerably higher than those of their solutions.

The titration curves show that there is a definite chemical neutralization reaction between the phenolic type resins and acid and alkali, respectively. The amount of acid or acid-generating catalysts added to cure this type of resinous adhesive at room temperatures is generally greater than the neutral equivalent of the resin. Since this additional acid is not destroyed or is only loosely bound to the resin, it is free to cause deterioration of the materials in the structure.

The flexural strengths of the unaged panels made with the resorcinol-formaldehyde resin did not undergo a

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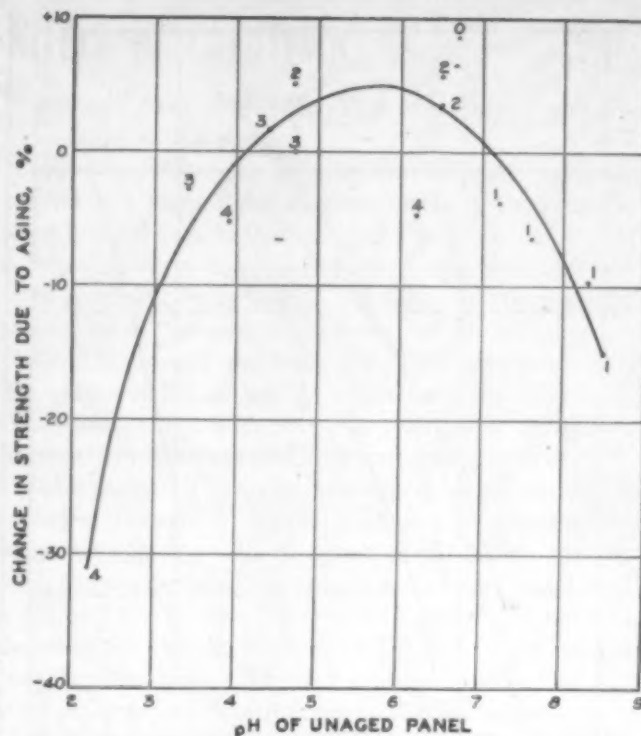
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9—Effect of oven-fog-aging on flexural strength of birch plywood bonded with Cascophen LT-67, using acidic and basic catalysts. Sample 0) no catalyst, 1) sodium hydroxide, 2) trichloroacetic acid, 3) benzenesulfonic acid, 4) hypophosphorous acid

significant decrease with increasing acidity of the resin solution. However, the oven-fog aging conditions brought about a substantial reduction in strength which correlated with decrease in pH. Thus, although the pH of the unaged panels in many instances appeared to be beyond the critical acid range, the acid which had been absorbed by the resin was available to bring about deterioration of panel under aging conditions (Fig. 7, page 196). The strong acids, such as hydrochloric, nitric and sulfuric acids, had only slightly more deteriorating action than the weaker types, such as nitranilic and hypophosphorous acids (Fig. 8, page 197).

An attempt was made to treat a phenol-formaldehyde resin, Cascophen LT-67, with the same series of acids used in the experiments with the resorcinol-formaldehyde resin. However, in the presence of hydrochloric, nitric, sulfuric, phosphoric and nitranilic acids, the resin precipitated from solutions.

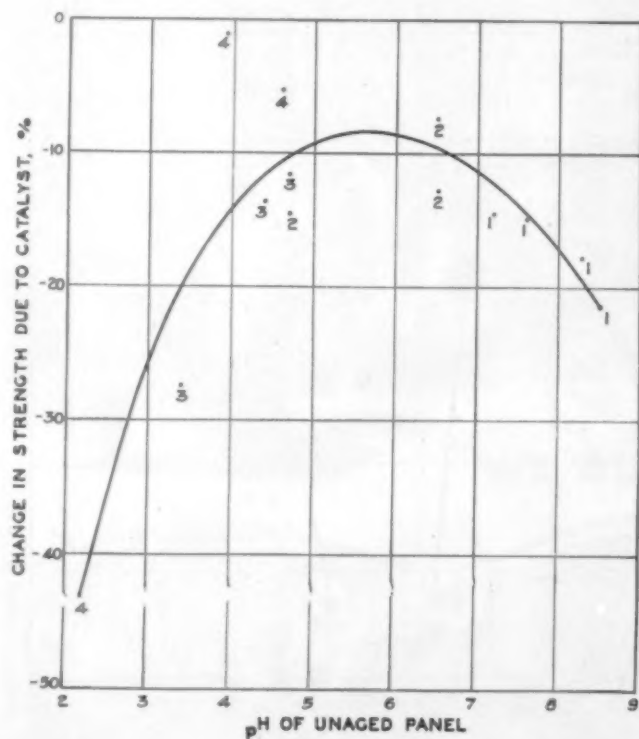
The results obtained with the weaker acids (Figs. 4, 5, 9 and 10) were comparable to those obtained with these same acids added to the resorcinol resin. When hypophosphorous acid was added to the resin solution in amounts sufficient to lower the pH of the plywood panel prepared with it to 2.2, a considerable decrease in flexural strength occurred in the oven-fog aging tests. A similar effect was observed with another phenol-formaldehyde resin, Durez 12041. It is noteworthy that the flexural strengths of the unaged panels prepared with the phenol-formaldehyde resins were, in general,

slightly higher than those of the resorcinol-formaldehyde panels.

The Cascophen LT-67 resin was also treated with various amounts of sodium hydroxide, a strong base. No evidence of significant deterioration in strength of the unaged plywood by relatively large amounts of the alkali was noted. However, there was some decrease in strength when the plywood was exposed to oven-fog aging conditions. The decrease in strength correlated with increase in pH from an initial value of 6.4 for the aged panel without added alkali to 8.2 for the aged panel with the greatest amount of added alkali. Attempts to cure urea-formaldehyde resin adhesive at high pH values by adding alkalis were unsuccessful.

In general, the results shown in Figs. 6 and 11 for tests made with various commercial catalysts and resins show a correlation between the strength of the plywood and the pH of the unaged panels. The pH of the resin films prepared with these commercial resins, using the recommended amounts of the catalysts, were all less than 2.0 and it was not possible to predict from these values what the plywood pH was (Fig. 11).

The marked decrease in strength of the unaged plywood panels which resulted generally throughout the experiments reported herein when the pH of the panels was lowered by acid catalysts indicated that the wood was being attacked by the acids. The data in Table I and Fig. 12 indicate that both pH and catalyst radical have a part in this breakdown. Hydrochloric, benzenesulfonic, nitric and sulfuric acids had the most pro-



10—Effect of various catalysts on flexural strength of oven-fog-aged birch plywood bonded with Cascophen LT-67. Sample 1) sodium hydroxide, 2) trichloroacetic acid, 3) benzenesulfonic acid, 4) hypophosphorous acid

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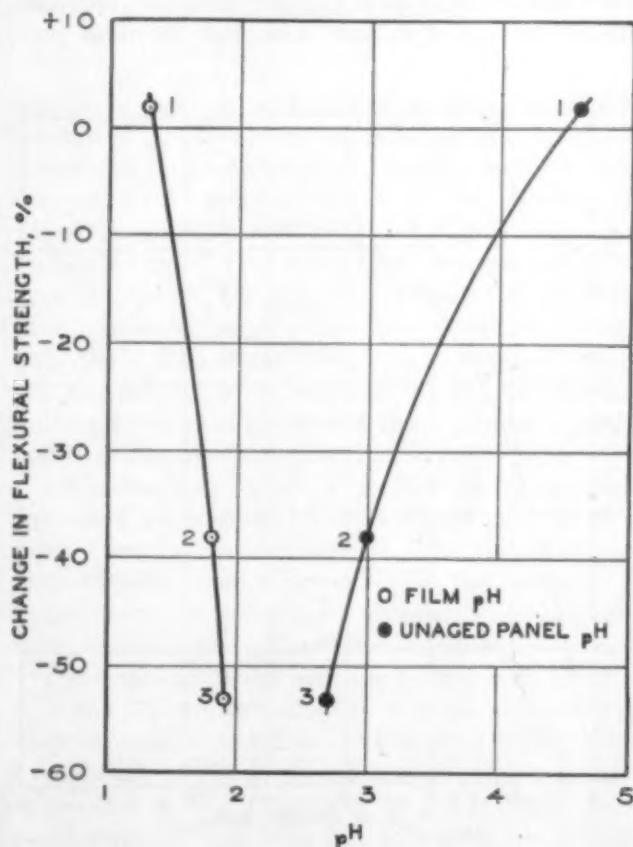
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nounced deteriorating effect on the birch wood. Nitranilic and hypophosphorous acids had considerably less deteriorating action on the wood. This is particularly evident from a comparison of strengths for the birch veneers treated with the respective acids to produce pH conditions in the range 2.1 to 2.4. A marked decrease in strength occurred in every case when the pH of the birch veneers was lowered below pH 2.0 by treatment with the respective acids. The wood had a strong buffering action against alkalies. However, a pronounced decrease in strength occurred when the pH of the wood was raised to 8.8 by absorption of tetraethanolammonium hydroxide.

### Conclusions

The flexural, impact and shear strengths, both initially and after aging, of urea and phenolic resin-bonded birch plywoods are definitely affected by the pH. In the acid range, the lower the pH of the plywood panel, the poorer is the strength of the panel and its resistance to aging. The lower critical pH value below which optimum strengths are not obtained and deterioration upon aging becomes appreciable, is approximately 4 for urea resin-bonded plywoods and 3.5 for phenolic resin-bonded plywoods. The decrease in strength on aging of birch plywood bonded with a phenolic resin catalyzed with a strong alkali (sodium hydroxide) correlated with increase in pH of the plywood. The upper



11—Effect of catalyst (3.2 percent XK-2997) on flexural strength of oven-fog-aged birch plywood bonded with various phenolic resins. Sample 1) Durez 12041, 2) Bakelite XC-11749, 3) Bakelite XC-3931

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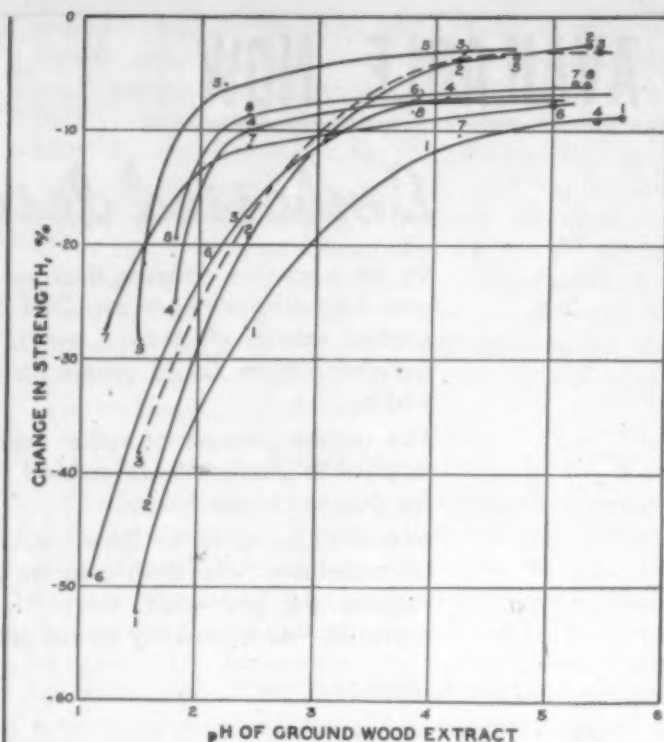
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12—Effect of various acids on flexural strength of birch wood. Sample 0) no acid (water treated only), 1) hydrochloric acid, 2) nitric acid, 3) sulfuric acid, 4) phosphoric acid, 5) hypophosphorous, 6) benzenesulfonic acid, 7) trichloroacetic acid 8) nitrilic acid

critical pH value, above which optimum strengths are not obtained and deterioration upon aging becomes appreciable, appears to be in the neighborhood of 8 for phenolic resins; the value for urea resin-bonded plywoods was not established.

The delamination of birch plywoods made with urea-formaldehyde resins is affected by the pH; in the acid range, the lower the pH, the fewer cycles required for delamination to occur. The delamination of birch plywoods made with phenolic resin is not affected by the pH; when the pH is less than 3.1, the materials are not as flexible as those with pH values of 3.6 or more. In one-year roof-aging tests delamination occurred only in the case of plywood bonded with casein and with urea-formaldehyde resins containing acid catalysts which reduced the pH of the unaged panel to 3.4 or less.

At a given pH, strong acids, such as hydrochloric, nitric and sulfuric acids, had only slightly greater deteriorating action on resorcinol-formaldehyde resin-bonded birch plywood than did the weaker types.

The pH values of the birch plywoods are not markedly changed by heating (40 hr. at 176° F.), exposure to heat and fog or outdoors for one year.

Both pH and the nature of the acid radical have an effect on the deterioration of birch wood by acids. At a given pH weak acids have considerably less deteriorating action on the wood than do strong acids. A pronounced decrease in strength of birch wood occurred when the pH of birch wood was raised to 8.8 by absorption of tetraethanolammonium hydroxide.

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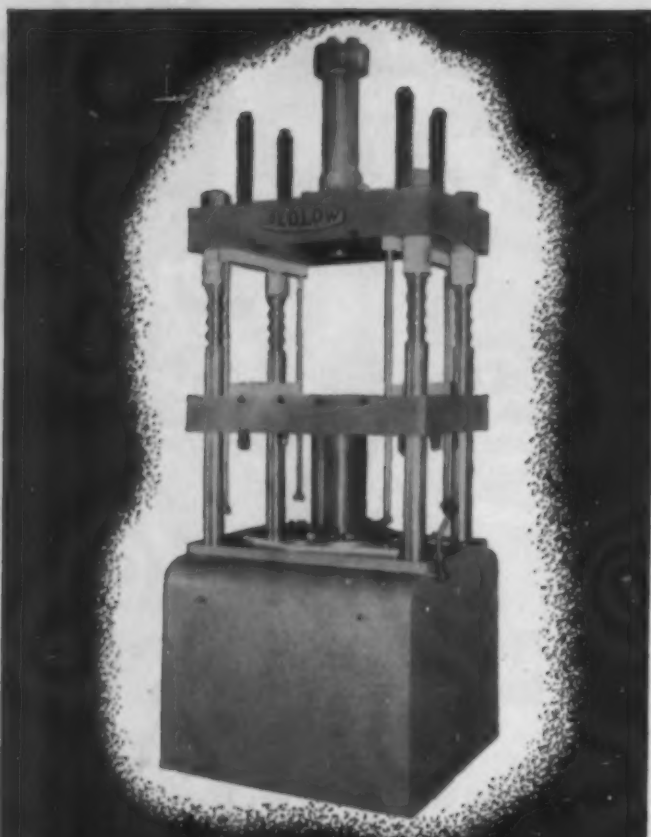
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## Methacrylate polymers

(Continued from page 130) of the framework (Fig. 2). The coils of material on top of the platen are charred cell-sealing paper.

In operation the two glass plates, 1700 by 2000 mm., are inserted between the steel platens, centered properly, and fixed in place by application of vacuum. The upper plate is then lowered so as to contact the bottom plate. Next the bottom plate is levelled by tightening the adjusting screws until further movement by hand adjustment is impossible. In this manner irregularities in the glass surface are compensated. The upper platen is then moved vertically the exact distance required for the desired thickness of sheets. The paper tape is then applied to ready the cell for filling. Two women operators devoted their time to the project and required a period of 3 min. for the complete preparation of a cell.

The cells are swung vertically around the horizontal axis and filled with monomer containing plasticizer and 0.1 percent benzoyl peroxide. It is sealed and the paper coated on the outside with a waterproof lacquer—Rohagit S dispersion. The cell is then stacked horizontally on a rack. The rack is lifted by a crane and immersed completely in a waterbath (Fig. 3), consisting of a brick-lined tank 10 ft. long, 4 ft. wide and 6 ft. deep.

Polymerization takes place at 34 to 42° C., according to thickness, and takes 36 to 48 hr. to reach 93 percent completion. The filled rack is then removed, placed in a lead-lined box (Fig. 3) and heated to 100° C. by injecting live steam. After 4 hr., polymerization is complete and the cells are then completely dismantled.

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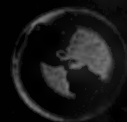
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Experimental and development work was conducted on new copolymers of methyl methacrylate. A series of products containing 1 to 2 percent of allyl acrylate, allyl methacrylate, methallyl methacrylate and dimethylene dimethacrylamide were prepared. These monomer materials tended to cross link the product, raising its softening point about 10° C., but also reducing markedly its moldability. No commercial development was attained because the products did not resist boiling water satisfactorily, were yellow in color and tended to crack on molding.

Some experimental work was done on mixtures of vinyl methacrylate with methyl methacrylate. This material had a hardness of 180° C. on the Vicat scale compared with 120° C. for methyl methacrylate polymer. While this copolymer could not be molded, it was possible to form the material into sheets by casting. These sheets could then be worked mechanically by cutting, heating and shaping into the desired article. The development was considered promising but it had not yet been put into commercial production.

Copolymerization of methyl methacrylate and styrene was investigated to obtain materials having a range of refractive index for use in lenses. The Heraeus Co. of Hanau near Frankfurt experimented with silicon dioxide as a scratch-resistant coating without success.

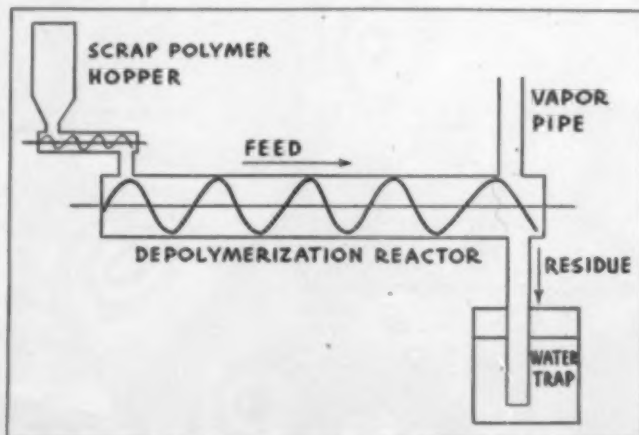
### Recovery of acrylic scrap<sup>2</sup>

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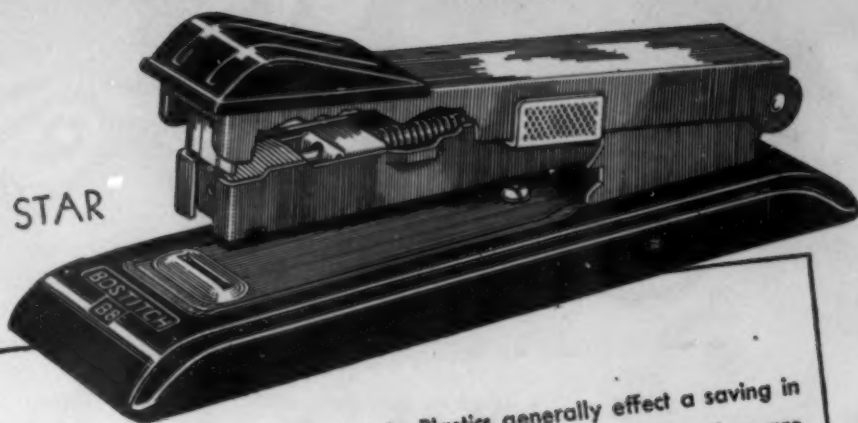
<sup>1</sup> "Rohm and Haas, Darmstadt, Germany," by J. G. Kern, R. L. Murray and R. W. Sudhoff, PB 227.

<sup>2</sup> "Investigation of German plastics plants. Part 2," by J. H. Rooney, G. M. Kline, J. W. C. Crawford, T. W. M. Pond, T. Love and R. H. Richardson, PB 25642.



4—Diagram showing the depolymerization of methyl methacrylate scrap material

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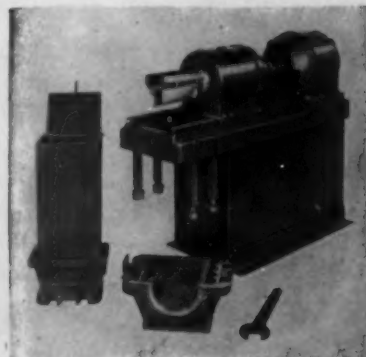
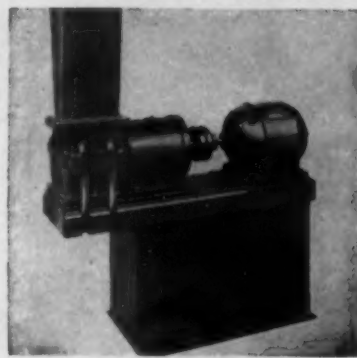
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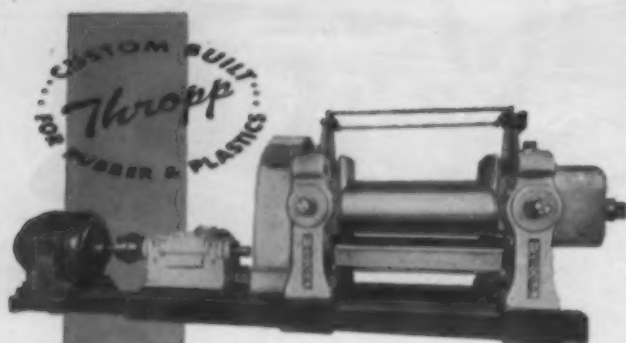
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the depolymerization reactor consists of a steel tube of length approximately  $2\frac{1}{2}$  meters and average diameter 30 cm. A conveyor screw passes down its length. The tube is of slightly oval cross section to allow of escape of vapors past the screw. This tube is heated by electricity. At one end the scrap is fed into the reactor from a hopper by means of another screw conveyor. At the other end of the reactor are a vapor riser pipe leading to a condenser, and a downfall pipe leading to a water sealed trough. The whole apparatus is made of steel; the reactor tube is made of heat-resistant steel. The operating temperature of the reactor varies along its length between 380 and 400° C.

The scrap which is fed into the reactor is moved along it by the screw, undergoing depolymerization meanwhile. Depolymerization is largely complete; non-volatile appearing at the end of the screw conveyor consists of a little carbon, with at times some still undepolymerized material. Water runs through the trough into which the non-volatile falls. The carbon is carried away by the water; the undepolymerized material remains in the trough, from which it is removed from time to time and returned to the scrap hopper.

The vapors passing out of the reactor via the riser piper are condensed. The condenser is connected to a large water vacuum pump, which carries away under slightly reduced pressure the unpleasant smelling gases evolved in the process.

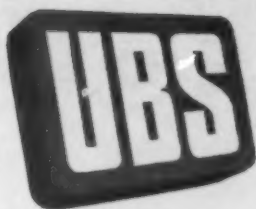
The condensate is dissolved in concentrated sulfuric acid to give a homogeneous solution. This is diluted with water to cause separation into two layers. The ester layer is separated, washed with water and fed to the monomer purification still of the fresh monomer plant. The sulfuric acid layer is steam distilled and the steam distillate is treated as crude ester in the monomer plant. The plasticizer (4 percent dibutyl phthalate) does not interfere with the depolymerization. Overall recovery of purified monomer is about 80 percent.

### Granular polymethyl methacrylate

Production of a granular methyl methacrylate polymer (Plexigum M263) was accomplished by the emulsion method. One part of monomer was mixed with



5—View of the destruction of the plant for making methyl methacrylate in Darmstadt, Germany



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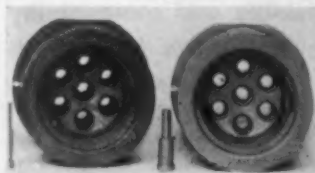
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6—A close-up of the destroyed Darmstadt plant for making methyl methacrylate, showing damage caused by bombs

two parts of water. Magnesium carbonate (Verteiler) of the type employed as a filler for rubber was used to provide polymerization nuclei. For fine granules, 18 grams were used per liter of water; for large granules (for molding powders), 8 to 10 grams. Polyacrylic acid and a copolymer of 70 parts methacrylic acid and 30 parts methyl methacrylate were also tried as a distributor in making methacrylate polymers, but they are not as good under pressure as magnesium carbonate.

The catalyst was benzoyl peroxide. For producing low molecular weight polymer (80,000 to 140,000 range by Staudinger and Schultz viscosity method) for use in lacquers and dentures, 0.2 percent of catalyst was used, based on the monomer. For producing mixed polymers of molecular weight 40,000 to 60,000 for lacquers, 0.4 percent of catalyst was added. The molecular weight is also regulated by the temperature of polymerization. To make polymers for injection molding, 2 percent of cetyl alcohol based on monomer was added as lubricant.

The mixture is stirred in the reaction kettle and heated to 80° C. The temperature increases from the heat of reaction to 120° C. and the pressure rises to 3½ atmospheres. Arms of stirrer are at right angles at two different points on the shaft to avoid pockets for accumulation of polymer. The speed is 130 r.p.m. Too slow a speed gives large granules which result in a temperature rise and hence a lower molecular weight.

The polymerization is complete in about 1 hour. The mixture is cooled with water and sulfuric acid (130 percent theoretical of a 20 percent solution) is added to



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By merely glancing over the illustrations it is clear that the forming of the plastic parts required skill, experience and facili-

ties to produce any quantity of odd-shaped parts required. But this is typical of the type of problem K-Plastix is equipped to solve.

The salter machine has wide application in food industries, by canners of vegetables, fish, tomato juice and other products where calcium chloride and sodium chloride are used in the processing. The correct application and fabrication of plastics can solve problems in many industries.

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dissolve the magnesium carbonate. Silicates in the magnesium carbonate cause haze. The polymer is separated by centrifuging in a stainless steel basket lined with stainless steel gauze, washed five times with water to remove sulfuric acid, and placed on an aluminum tray to a depth of 3 cm. to dry at 80° C. for 8 hours. The yield in the form of beads or pearls of less than 1 mm. diameter is greater than 97 percent theory.

For dental material, the polymer is sieved through a screen of 400 mesh/sq. cm. directly after drying; material for compression molding is sieved through a screen of 196 mesh/sq. cm. For injection molding powder, the granules are rolled for 8 to 10 min. at 170 to 190° C. on mixing rolls 1.5 m. long by 0.6 m. diameter, and coloring material is added when required. The plastic is taken off the rolls in sheets and ground in a biscuit crusher mill at 3000 r.p.m. The particle size of the final powder is about 2 to 5 mm. The molecular weight is lowered about 20 percent on the mixing rolls. The molding powders were used for the usual types of applications, such as electrical parts, cover lights for aircraft, compasses for submarines and the like.

**Plexigum M224**—A special methyl methacrylate polymer of low molecular weight (40,000–60,000) for use in wartime lacquers was made with 8 to 10 grams per liter of magnesium carbonate. The lacquers were used in coating metal and wood and on food containers. They were not suitable in contact with acid products.

**Plexigum M272**—This is a pearl polymer made by copolymerizing methyl methacrylate with 7 to 8 parts of methyl acrylate. It has a Vicat hardness of approximately 105° C. and possesses better injection molding qualities than the straight methyl methacrylate polymer, particularly with respect to the elimination of cracking during molding.

**Rohagit S**—This is an alkali-soluble copolymer made with 65 percent methacrylic acid and 35 percent methyl methacrylate.<sup>5</sup> Methyl methacrylate is emulsified in a 1 percent aqueous solution of sodium polyacrylate. Sodium hydroxide is added over a period of 1 hr. to saponify 65 percent of the methyl methacrylate; the temperature rises to 70 to 75° C. Sulfuric acid (20 percent excess) is added to neutralize the alkali over a period of 40 min. with stirring. Benzoyl peroxide catalyst is added: for a high molecular weight product, 0.2 percent based on the monomer; for a low molecular weight, 1 percent. The temperature is raised to 80 to 85° C. and maintained by cooling with running water during refluxing. Polymerization time is 2 to 3 hours. The temperature peak during the polymerization is 128° C. The fine powder is separated by filtration, washed with water 4 or 5 times to get rid of sulfuric acid, and dried in an oven at 90 to 100° C. for 10 to 12 hours. The output was approximately 8 tons per month in 1944.

Rohagit S was used in concentrations of 0.5 to 1.0

<sup>5</sup> It was also reported to us by another engineer in the plant that the composition of Rohagit S is 70 percent methyl methacrylate and 30 percent methacrylic acid. An analysis of the product, made by I. G. Farbenindustrie in 1941, indicated a composition of 80 percent methacrylic acid and 20 percent methyl methacrylate. It is thought that a series of copolymers must have been prepared with methacrylic acid and methyl methacrylate to obtain different properties, comparable to practice in preparing methacrylamide-methacrylic acid copolymers described later.

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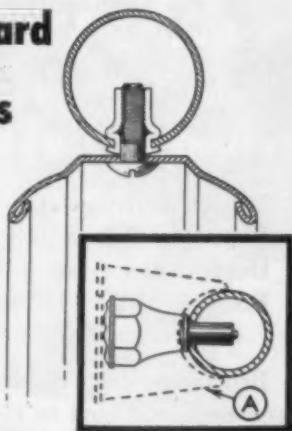
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percent as a thickening agent for emulsions and dispersions of resins (acrylates and vinyl acetates). It was also used in stiffening fabrics, impregnation, coatings, adhesives and as an emulsifying agent for lubricating oils. It was used as an adhesive on envelopes during the war, but is not recommended for this use.

Rohagit WL-1 was the trade name for a series of methacrylamide-methacrylic acid copolymers made in the approximate proportions 90-10, 80-20 and 50-50. These products were usually soluble in ammonia and alkaline solutions and were used very largely as textile sizing.\*

### Emulsion-type lacquer resins

#### Plexigum B50

50 percent methyl methacrylate  
50 percent ethyl acrylate.

The interpolymers are made by the granular technique, as has been described for the methyl methacrylate polymer. The polymer is soluble in butyl acetate, toluene, xylene, benzene. It is used as a constituent of sprayed metal lacquers, being modified with respect to plasticization and pigmentation by the customers who purchase the resin.

#### Plexigum M315

60 percent methyl methacrylate  
20 percent ethyl acrylate  
20 percent butyl acrylate

This was produced during the war (since 1942) because of a shortage of ethyl acrylate. Plexigum M310 differs slightly from M315 in composition. The polymerization process was the same as for M263.

### Solution type lacquer resins (30 to 40 percent)

Methyl methacrylate in xylol

Methyl methacrylate in ethyl acetate

Butyl methacrylate in benzene

B50 and M315 in a mixture of butyl acetate, xylol and 4 percent of butylene glycol.

Benzoyl peroxide catalyst (0.5 to 1.0 percent based on monomer) is added to the solution. One-third of the batch is heated to 70 to 80° C. for about 4 hours. When the polymerization starts, the temperature rises; one-sixth of the batch is run in to control the temperature; the remainder is added regularly over a period of 5 to 6 hours. The batch is heated slightly below the boiling point of the solvent (not over 110° C.) to complete the polymerization. The total time required for a batch is 36 to 48 hours. The molecular weight of the polymer is about 30,000 to 40,000.

The output of all lacquer resins was 30 to 50 tons per month in 1943. The acrylate resin solutions were used in making artificial leather, finishing textiles and lacquer coatings for light metals. They were generally used in admixture with other resins.

\* "German plastics practices," by J. M. DeBell, W. C. Goggin and W. E. Gloor, PB 12467.

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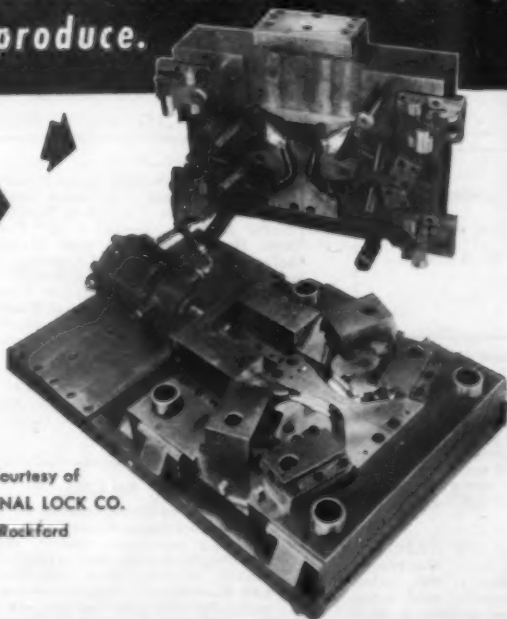
Chicago Representative: Acme Plastics Supply Co., 853 Chicago Ave., Evanston, Illinois.

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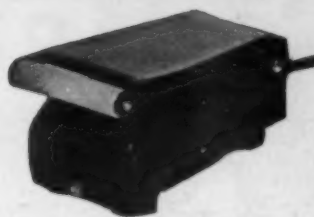


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**WANTED: PLASTIC SCRAP OR REJECTS** in any form. Cellulose Acetate, Butyrate, Polystyrene, Acrylic, Vinyl Resin, etc. Also wanted surplus lots of phenolic and urea molding materials. Custom grinding and magnetizing. Reply Box 318, Modern Plastics.

**FOR SALE:** Angle Molding Hydraulic Press Watson-Stillman, suitable for Split Molds and for Molding Complicated Parts by the transfer method. 3 horizontal double acting rams, 13 1/2", 8" and 6" arranged in "T". Reply Box C132, Modern Plastics.

**EXCHANGE OR FOR SALE:** One 50-Ton Stokes Fully Automatic Molding Press Model 235. Would prefer to exchange for 200 or 300 Ton Stokes Molding Press. Reply Box C383 Modern Plastics.

### WANTED

Mechanical Engineer experienced in designing and styling plastic and metal toys and novelties. Newark, New Jersey area. Write Box C373, Modern Plastics. State experience and reference.

**WANTED**—Phenolic Molding Material. Will buy your surplus Phenolic molding material. Write type, manufacturer and quantity involved. Address Box C374, Modern Plastics.

**SALES DEVELOPMENT**—Position open for Chemist or Chemical Engineer with Bachelor's degree as minimum educational requirement and two to five years experience in plastics. Technical Sales or Sales Engineering experience in compression molding, laminating, adhesive, plywood, casting or other thermosetting resin fields desirable. Laboratory or production experience in these fields also of value. Location: San Francisco, California. Please submit details, including education, industrial experience, age, salary requirements and photograph if available. Reply to Shell Chemical Corporation, Industrial Relations and Personnel, 100 Bush Street, San Francisco, California.

### FOR SALE: SACRIFICE

1 New Thermionic Dielectric Generator. Model M285 with two T-GRA Rectifier tubes and one additional variable coupler. Cost new approximately \$6,000.00. Sacrifice \$3,000.00. Phone or write: Mr. A. V. Lynas, Sav-Way Industries, Inc., Box #117, Harper Station, Detroit 13, Michigan. Twinbrook 1-9110.

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**FOR SALE**—1—Watson Stillman Hydro-Pneumatic High and Low Pressure System, complete with pumps, tanks, boilers, etc., for 3000# operation. 2—Baker Perkins 100 gallon Plastic Mixers. 1—12" x 12" Press 7" Ram. Steel Heated Platens and Hand Pump attached; 1—24" x 24" Adamson, 10" ram, 2-opening Hydraulic Press; 1—24" x 24" Farrell, 10" ram, 2-opening Hydraulic Press; 1—30" x 30" D&B, 2-open, steel heated Platens 12" ram; 2—La Pointe Hydraulic Pumps, 150 G.P.M.—2000 lb. pressure direct motor driven to 125 HP AC motors; 1—French Oil Hydropneumatic Accumulator; 1—14" x 24" Press, 9" ram; 6—Hydraulic Presses, 20" x 20", 12" x 14"; Dry Powder Mixers; Pulverizers, Grinders, etc. Send for complete list. Reply Box 1545, Modern Plastics.

### BRAZIL

The plastics department of S. M. B. wishes to represent manufacturers of: Molding powders, resins, dyes, and related chemicals and materials; laminates; sheets, films, rods, etc.; yarns and filaments; machinery and equipment for the plastics industry. Reply to: Caixa Postal 4730, S. Paulo, Brazil.

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Sales Representative with excellent contacts in Northern New York State anxious to affiliate with large outfit near by who can handle large orders in laminates. Also casting, compression and injection work. Give complete facilities and commissions paid. Might consider going to East or Southwest coast for your firm. Reply Box C381, Modern Plastics.

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WANTED: Scrap sheet lucite. Kindly give all information in your first letter. Prefer regular supply of odds and ends from manufacturer. Reply Box C376, Modern Plastics.

First class firm established in Chile, South America, wants connections with Injection Molding processor for exchanging of molds or buy used ones. Is also interested in associating with credited industrialist who wants to start business in Chile in the fields of Compression, Injection, Extrusion or Calendering. Address: L. Garcia, Casilla 3876, Santiago de Chile, South America.

FOR SALE: 3-Baker Perkins jacketed Mixers 100, 20 & 9 gals. capacity; New Rotary Cutters; HPM 500 ton Mold. Presses 42" x 48"; D.B. 500 ton 42" x 48"; Adamson 400 ton 27" x 24"; 20" x 20"; also 20 to 250 tons from 36" x 36" to 12" x 12"; Farrel 16" x 48", 2 Roll Rubber Mill; Stokes Rotary Preform Tablet Machines 1 1/16" & 5/8"; 40 ton Broaching Press; Injection Molding Machines; Watson-Stillman Hor. 4 Plgr. 1" x 2" x 4" H.&L. Pressure Pumps; HPM 1 1/2" x 6" vertical Triplex 10 GPM 2700 lbs.; 7 Hydr. Oil Pumps, Vickers, Oilgear, Northern, etc.; Elmes 1" x 4" & 1 1/2" x 4" hor. 4 plgr. 5 to 8 GPM 4500 lbs. & 5500 lbs.; Rumsey 4 1/2" x 8" vert. Triplex. 65 GPM 900 lbs.; Elmes 2 1/2" x 4" hor. 2 plgr., 17 GPM 850 lbs.; New Vickers 1 1/4" Oil Relief Valves; New Vickers 3/4" Flow Control Valves; Hydr. Steam Pumps; Low Pressure Pumps 150 to 600 lbs.; Hydr. Accum.; Heavy Duty Mixers Grinders; Pulverizers; Gas Boilers; etc. Partial Listing. We buy your used machinery. Stein Equipment Co., 90 West St., New York 6, N. Y. Canal 6-8147.

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SALES REPRESENTATIVES desired by plastic fabricator and laminator for midwest and eastern distribution—To sell transparent containers—laminated displays—fabricated plastic displays on liberal commission basis. Exclusive franchises considered for many territories still open. Reply Box C389, Modern Plastics.

AVAILABLE. Executive with extensive experience in the mfg. of plastic materials; expert in coloring and designing; desires position as superintendent or the like, where qualifications will be utilized; has been associated with plastic industry for 30 years; has 20 years' supervisory experience in executive positions. Address Box C387 Modern Plastics.



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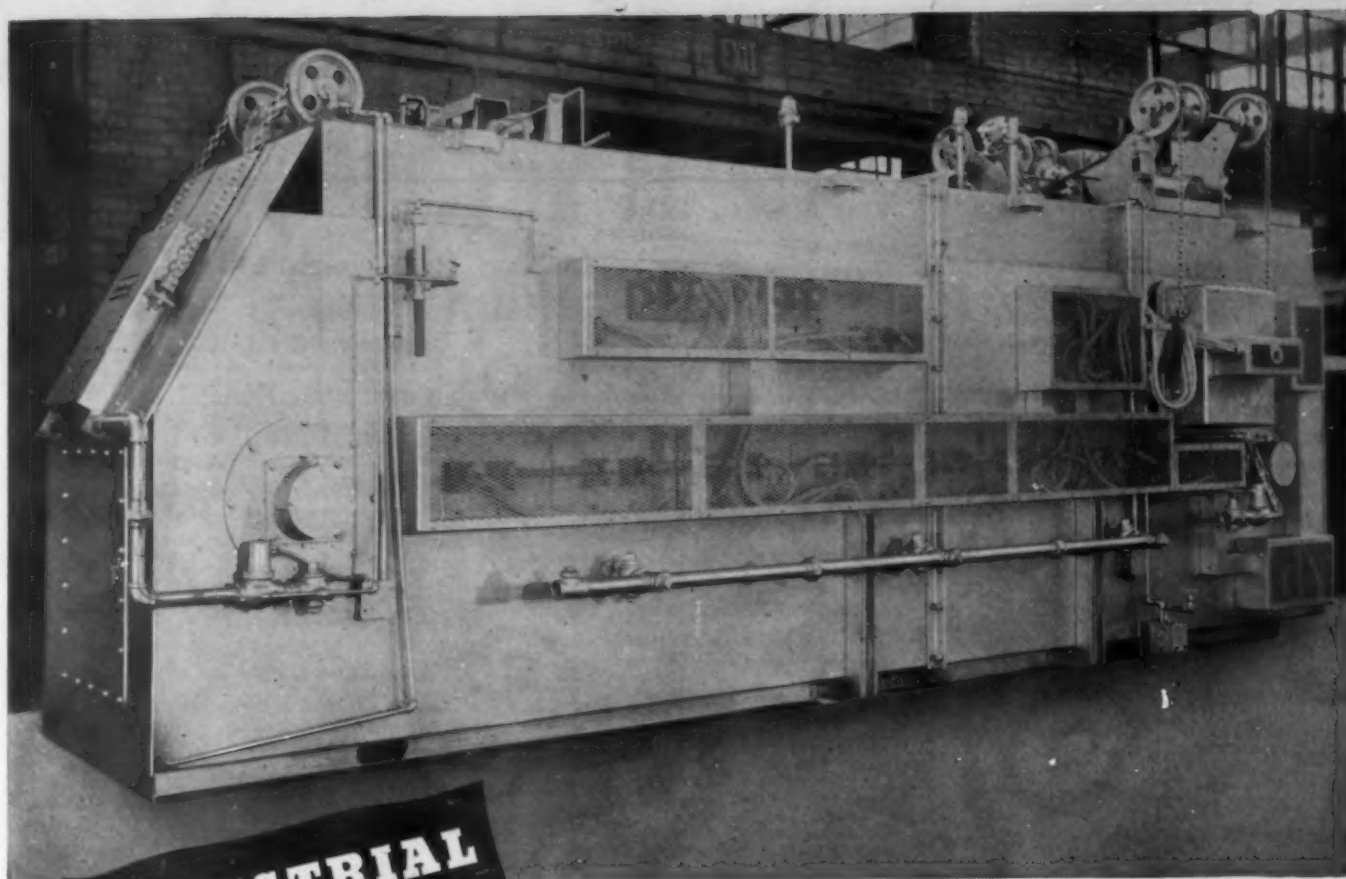
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# MODERN PLASTICS ADVERTISERS

JULY 1947

<b>Accurate Molding Corp.</b> ..... 185 <i>Agency—ROTHSCHILD ADV. AGENCY</i>	<b>Carter Products Corp.</b> ..... 165 <i>Agency—CHARLES OSWALD</i>	<b>Durez Plastics &amp; Chemicals, Inc.</b> ..... <i>Inside Front Cover</i> <i>Agency—COMSTOCK, DUFFES &amp; Co.</i>
<b>Advance Solvents &amp; Chemical Corp.</b> ..... 210 <i>Agency—S. DUANE LYON, INC.</i>	<b>Carver, Fred S., Inc.</b> ..... 198 <i>Agency—J. C. BULL, INC.</i>	<b>Durite Plastics, Inc.</b> ..... 58 <i>Agency—LAWRENCE I. EVERLING</i>
<b>Airtronics Mfg. Co.</b> ..... 197 <i>Agency—LARRY PENDLETON &amp; ASSOC.</i>	<b>Catalin Corp. of America</b> ..... 1 <i>Agency—WALTER J. GALLAGHER ADV.</i>	<b>Elco Tool &amp; Screw Corp.</b> ..... 225
<b>Aldrich Pump Co., The</b> ..... 24 <i>Agency—HARRIS D. MCKINNEY</i>	<b>Celanese Plastics Corp. (Div. of Celanese Corp. of America)</b> ... 9 <i>Agency—ELLINGTON &amp; Co., INC.</i>	<b>Elmes Engineering Works of American Steel Foundries</b> .... 23, 57 <i>Agency—ERWIN, WASEY &amp; Co., LTD.</i>
<b>Allied Products Corp.</b> ..... 153, 170 <i>Agency—CHARLES M. GRAY &amp; ASSOC.</i>	<b>Celluplastic Corp.</b> ..... 44 <i>Agency—LAWRENCE FERTIG &amp; Co., INC.</i>	<b>Engis Equipment Co.</b> ..... 158 <i>Agency—CENTRAL ADVERTISING SERVICE</i>
<b>American Cyanamid Co.</b> .... 22, 118-119 <i>Agency—HAZARD ADVERTISING Co.</i>	<b>Central Screw Co.</b> ..... 225	<b>Enjay Co., Inc.</b> ..... 163 <i>Agency—McCANN-ERICKSON, INC.</i>
<b>American Insulator Corp.</b> ..... 72 <i>Agency—WM. B. KAMP, INC.</i>	<b>Chemaco Corp.</b> ..... 27 <i>Agency—R. T. O'CONNELL Co.</i>	<b>Enjay Co., Inc.</b> ..... 185
<b>American Molding Powder &amp; Chemical Corp.</b> ..... 213 <i>Agency—H. W. FAIRFAX ADV. AGENCY, INC.</i>	<b>Chicago Molded Products Corp.</b> 4 <i>Agency—ALMON BROOKS WILDER, INC.</i>	<b>Erie Engine &amp; Mfg. Co.</b> ..... 181 <i>Agency—THE YOUNT Co.</i>
<b>American Plastics Corp.</b> ..... 173 <i>Agency—GALLARD ADVERTISING AGENCY</i>	<b>Claremont Waste Mfg. Co.</b> ..... 122 <i>Agency—WALTER J. GALLAGHER ADV.</i>	<b>Erie Resistor Corp.</b> ..... 120 <i>Agency—W. S. HILL Co.</i>
<b>American Plastics Engineering Corp.</b> ..... 208	<b>Classified</b> ..... 216, 218	<b>Exact Weight Scale Co., The</b> .... 200 <i>Agency—J. W. SIEVERLING</i>
<b>American Rotary Tools Co., Inc.</b> 215	<b>Cleveland Container Co.</b> ..... 224 <i>Agency—THE NESBITT SERVICE Co.</i>	
<b>American Screw Co.</b> ..... 46, 225 <i>Agency—SUTHERLAND-ABBOTT</i>	<b>Collier, R. T., Corp.</b> ..... 144 <i>Agency—LITTLE ADVERTISING AGENCY</i>	
<b>Anigraphic Process, Inc.</b> ..... 198	<b>Colonial Rigging and Haulage Corp.</b> ..... 164	
<b>Atkins, E. C. &amp; Co.</b> ..... 175 <i>Agency—EVANS ASSOCIATES Co.</i>	<b>Connecticut Plastic Products Co.</b> 152 <i>Agency—PHILLIPS WEBB UPHAM &amp; Co.</i>	<b>Fabiricon Products, Inc.</b> ..... 174
<b>Atlas Valve Co.</b> ..... 162 <i>Agency—W. F. SCHAPHORST AGENCY</i>	<b>Consolidated Molded Products Corp.</b> ..... 31 <i>Agency—WALTER J. GALLAGHER ADV.</i>	<b>Farrel-Birmingham Co., Inc.</b> .... 34 <i>Agency—GASSAWAY, MARK &amp; Co.</i>
	<b>Continental Screw Co.</b> ..... 225	<b>Fellows Gear Shaper Co., Plastics Machine Div.</b> ..... 59 <i>Agency—HICKS &amp; GREIST, INC.</i>
<b>Bakelite Corp.</b> ..... <i>Inside Back Cover</i> <i>Agency—J. M. MATHES, INC.</i>	<b>Corbin Screw Co.</b> ..... 225	<b>Felsenthal, G. &amp; Sons</b> ..... 51 <i>Agency—LIEBER ADVERTISING Co.</i>
<b>Baker Castor Oil Co., The</b> ..... 53	<b>Cowles Co. Inc., The</b> ..... 26 <i>Agency—BARLOW ADV. AGENCY, INC.</i>	<b>Ferro Enamel Corp.</b> ..... 150 <i>Agency—FULLER &amp; SMITH &amp; ROSS INC.</i>
<b>Baldwin Locomotive Works, The</b> 217 <i>Agency—KETCHUM, MACLEOD &amp; GROVE, INC.</i>	<b>Creative Plastics Corp.</b> ..... 39 <i>Agency—FRANK KIERNAN &amp; Co.</i>	<b>Flexmir, Inc.</b> ..... 45 <i>Agency—IRA S. KAHN AGENCY</i>
<b>Ball &amp; Jewell, Inc.</b> ..... 189 <i>Agency—LAWRENCE BOLES HICKS, INC.</i>	<b>Creative Printmakers, Inc.</b> ..... 178	<b>Fortney Mfg. Co., Inc.</b> ..... 176
<b>Bamberger, A., Corp.</b> ..... 147 <i>Agency—H. W. FAIRFAX ADV. AGENCY, INC.</i>	<b>Cruver Mfg. Co.</b> ..... 223 <i>Agency—EVANS ASSOCIATES Co.</i>	<b>Franklin Jeffrey Corp.</b> ..... 157
<b>Bell Telephone Laboratories, Inc.</b> ..... 28 <i>Agency—N. W. AYER &amp; SON, INC.</i>	<b>Cumberland Engineering Co.</b> ... 207 <i>Agency—RICHARD THORNDIKE</i>	<b>Franklin Plastics Div.</b> ..... 206 <i>Agency—THE YOUNT Co.</i>
<b>Birdsboro Steel Foundry &amp; Machine Co.</b> ..... 62 <i>Agency—BRAUMONT, HELLER &amp; SPERLING, INC.</i>	<b>Cunningham, M. E., Co.</b> ..... 168 <i>Agency—WALKER &amp; DOWNING</i>	
<b>Boonton Molding Co.</b> ..... 40 <i>Agency—THE FRANKLIN FADER Co.</i>		<b>General American Transportation Corp.</b> ..... 37 <i>Agency—WEISS &amp; GELLER</i>
<b>Bridgeport Moulded Products, Inc.</b> ..... 48	<b>Daniels-Kummer Engraving Co.</b> 215	<b>General Electric Co.</b> ..... <i>Back Cover</i> <i>Agency—BENTON &amp; BOWLES, INC.</i>
<b>Brillhart, Arnold, Ltd.</b> ..... 169 <i>Agency—HENRI LAMOTHE AGENCY</i>	<b>Dazor Mfg. Corp.</b> ..... 56 <i>Agency—WATTS ADVERTISING AGENCY</i>	<b>General Industries Co., The</b> .... 187 <i>Agency—FULLER &amp; SMITH &amp; ROSS INC.</i>
<b>Brown, J. J., &amp; Co.</b> ..... 201	<b>Detroit Stamping Co.</b> ..... 156 <i>Agency—CHARLES SCHWEIM Co.</i>	<b>Gering Products, Inc.</b> ..... 18 <i>Agency—DIEDRICH ADVERTISING SERVICE</i>
<b>Buttindex Corp.</b> ..... 180 <i>Agency—LANCASTER ADVERTISING</i>	<b>Disston, Henry &amp; Sons, Inc.</b> .... 42 <i>Agency—GEARE-MARSTON, INC.</i>	<b>Gerity-Michigan Die Casting Co.</b> 47 <i>Agency—BEESON-FALLER-REICHERT INC.</i>
	<b>Dow Chemical Co., The</b> ..... 143 <i>Agency—MACMANUS, JOHN &amp; ADAMS, INC.</i>	<b>Girdler Corp., The</b> ..... 68 <i>Agency—ROCHE, WILLIAMS &amp; CLEARY, INC.</i>
<b>Calresin Corp.</b> ..... 190 <i>Agency—MURRAY-DYMOCK, INC.</i>	<b>Drakenfeld, B. F. &amp; Co., Inc.</b> ... 194 <i>Agency—FULLER &amp; SMITH &amp; ROSS INC.</i>	<b>Goodrich, B. F., Chemical Co.</b> .... 3 <i>Agency—THE GRISWOLD-ESHELMAN Co.</i>
<b>Cambridge Instrument Co., Inc.</b> 150 <i>Agency—E. M. FREYTAG ASSOC., INC.</i>	<b>Duplan Corp.</b> ..... 121 <i>Agency—STERLING ADV. AGENCY</i>	<b>Goodrich, B. F., Co.</b> ..... 213 <i>Agency—BATTEN, BARTON, DURSTINE &amp; OSBORNE, INC.</i>
<b>Carborundum Co., The</b> ..... 167 <i>Agency—COMSTOCK, DUFFES &amp; Co.</i>	<b>du Pont de Nemours, E. I. &amp; Co., Electrochemicals Div.</b> ..... 30 <b>Plastics Div.</b> ..... 7 <i>Agency—BATTEN, BARTON, DURSTINE &amp; OSBORNE, INC.</i>	

(Please turn to page 222)

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**JULY • 1947**

**221**

<b>Great American Color Co.</b> ..... 215 <i>Agency—BODINE &amp; MEISSNER</i>	<b>Lamson &amp; Sessions Co.</b> ..... 225	<b>National Lock Co.</b> ..... 225
<b>Great American Plastics Co.</b> ..... 205 <i>Agency—WILLIAM G. SEIDENBAUM &amp; CO.</i>	<b>Lane, J. H. &amp; Co., Inc.</b> ..... 202	<b>National Plastic Products Co., The</b> ..... 177 <i>Agency—THE JOSEPH A. WILNER CO.</i>
<b>Greater New Orleans, Inc.</b> ..... 50 <i>Agency—BAUERLEIN ADVERTISING</i>	<b>LaRose, W. T. &amp; Associates, Inc.</b> 52 <i>Agency—HAROLD P. PRESTON</i>	<b>National Rubber Machinery Co.</b> 21 <i>Agency—THE GRISWOLD-ESHELMAN CO.</i>
<b>Greer Hydraulics, Inc.</b> ..... 158 <i>Agency—JOSEPH S. VOGEL &amp; CO.</i>	<b>Lester-Phoenix, Inc.</b> ..... 32 <i>Agency—GREGORY-HOUSE, INC.</i>	<b>National Screw &amp; Mfg. Co.</b> ..... 225
<b>Gypsy Dyes, Inc.</b> ..... 182 <i>Agency—JONES FRANKEL COMPANY</i>	<b>Lucidol Div., Novadel-Agene Corp.</b> ..... 162 <i>Agency—LANDSHEFT, INC.</i>	<b>National Transparent Plastics Co.</b> ..... 175 <i>Agency—DU PONT &amp; CAHALIN, INC.</i>
<b>Hannifin Corp.</b> ..... 148 <i>Agency—ARMSTRONG ADV. AGENCY</i>	<b>M &amp; N Machine Tool Works</b> .... 212 <i>Agency—THE FRANKLIN FADER CO.</i>	<b>Newark Die Co., Inc.</b> ..... 164 <i>Agency—ATLANTIC ADVERTISING CO.</i>
<b>Hardy Plastics &amp; Chemical Corp.</b> 145 <i>Agency—WALTER J. GALLAGHER ADV.</i>	<b>Maas &amp; Waldstein Co.</b> ..... 135 <i>Agency—DOYLE, KITCHEN &amp; MCCORMICK, INC.</i>	<b>New England Screw Co.</b> ..... 225
<b>Harper, H. M. Co., The</b> ..... 225	<b>Maine Development Commission</b> ..... 155 <i>Agency—BROOKE, SMITH, FRENCH &amp; DORRANCE, INC.</i>	<b>New Hermes, Inc.</b> ..... 202 <i>Agency—THE ARNOLD COHAN CORP.</i>
<b>Hein-Werner Motor Parts Corp.</b> 160 <i>Agency—ARTHUR R. MOGGE INC.</i>	<b>Majestic Molded Products, Inc.</b> 211 <i>Agency—ALFRED A. MORSE &amp; CO.</i>	<b>New Jersey Zinc Co., The</b> ..... 14
<b>Hercules Powder Co.</b> ..... 137 <i>Agency—FULLER &amp; SMITH &amp; ROSS INC.</i>	<b>Manufacturers Chemical Corp.</b> 27 <i>Agency—R. T. O'CONNELL CO.</i>	<b>Niagara Alkali Company</b> ..... 38A <i>Agency—HAZARD ADVERTISING CO.</i>
<b>House of Plastics, Inc.</b> ..... 180	<b>Marblette Corp., The</b> ..... 159 <i>Agency—PERLOWIN STUDIOS</i>	<b>Nixon Nitration Works</b> ..... 63 <i>Agency—ALFRED A. MORSE &amp; CO.</i>
<b>Hydraulic Press Mfg. Co., The</b> 13 <i>Agency—FULLER &amp; SMITH &amp; ROSS INC.</i>	<b>Martindell Molding Co.</b> ..... 218 <i>Agency—ELDRIDGE-NORTHROP, INC.</i>	<b>Northern Industrial Chemical Co.</b> ..... 207 <i>Agency—THE CALLAWAY ASSOCIATES</i>
<b>Ideal Plastics Corp.</b> ..... 181 <i>Agency—ATLANTIC ADVERTISING CO.</i>	<b>Materials &amp; Methods</b> ..... 70	<b>Norton Laboratories, Inc.</b> ..... 33 <i>Agency—COMSTOCK, DUFFES &amp; CO.</i>
<b>Industrial Plastics Co.</b> ..... 176 <i>Agency—WALTER L. RUBENS &amp; CO.</i>	<b>Maywald, Elmer C. &amp; Co., Inc.</b> 192 <i>Agency—ROBERT A. GALLAGHER ADV.</i>	<b>Owens-Corning Fiberglas Corp.</b> 193 <i>Agency—FULLER &amp; SMITH &amp; ROSS INC.</i>
<b>Injection Molding Co.</b> ..... 195 <i>Agency—RUSSELL C. COMER CO.</i>	<b>Mearl Corp., The</b> ..... 174	<b>Parker Appliance Company, The</b> 182 <i>Agency—FULLER &amp; SMITH &amp; ROSS INC.</i>
<b>Interlake Chemical Corp.</b> ..... 203 <i>Agency—THE BAYLESS-KERR CO.</i>	<b>Mears-Kane-Ofeldt, Inc.</b> ..... 161 <i>Agency—R. E. LOVEKIN CORP.</i>	<b>Parker-Kalon Corp.</b> ..... 64, 225 <i>Agency—HORTON-NOYES CO.</i>
<b>International Molded Plastics, Inc.</b> ..... 10 <i>Agency—THE WHITE ADVERTISING CO.</i>	<b>Meyer &amp; Brown Corp.</b> ..... 196 <i>Agency—FRIEWALD &amp; COLEMAN</i>	<b>Pawtucket Screw Co.</b> ..... 225
<b>International Screw Co.</b> ..... 225	<b>Michigan Molded Plastics, Inc.</b> 25 <i>Agency—WALLACE-LINDEMAN, INC.</i>	<b>Pedlow Machine Co.</b> ..... 204
<b>Inter-State Products Co.</b> ..... 205 <i>Agency—KURK &amp; BROWN, INC.</i>	<b>Midwest Molding &amp; Mfg. Co.</b> .... 157 <i>Agency—ROBERT A. GALLAGHER ADV.</i>	<b>Phelps Manufacturing Co., The</b> 29 <i>Agency—THE MERRILL ANDERSON CO.</i>
<b>Jeffrey, Franklin Corp.</b> ..... 157	<b>Milford Rivet &amp; Machine Co.</b> .... 225	<b>Pheoll Mfg. Co.</b> ..... 225
<b>Jersey Sheet Metal Products, Inc.</b> 184	<b>Mills, Elmer E., Corp.</b> ..... 71 <i>Agency—BOZELL &amp; JACOBS, INC.</i>	<b>Phillips Screw Manufacturers</b> ... 225 <i>Agency—HORTON-NOYES CO.</i>
<b>K-Plastix</b> ..... 211	<b>Minnesota Plastics Corp.</b> ..... 20 <i>Agency—WILSON ADVERTISING AGENCY</i>	<b>Pierce Machine Tool Company</b> .. 190 <i>Agency—ROBERT EMMET KEOUGH ASSOC.</i>
<b>Kearney &amp; Trecker Corp.</b> ..... 11 <i>Agency—KLAU-VAN PIETERSOM-DUNLAP ASSOCIATES</i>	<b>Miskella Infra-Red Co., The</b> .... 160 <i>Agency—FOLEY ADVERTISING AGENCY</i>	<b>Plaskon Div., Libbey-Owens-Ford Glass Co.</b> ..... 112-113 <i>Agency—MELDRUM &amp; FEWSMITH</i>
<b>Keyes Fibre Co.</b> ..... 17 <i>Agency—ALLEY &amp; RICHARDS CO.</i>	<b>Monsanto Chemical Co.</b> ..... 41, 183 <i>Agency—GARDNER ADVERTISING CO.</i>	<b>Plastic Laminating Corp.</b> ..... 165
<b>Kingsley Stamping Machine Co.</b> 197 <i>Agency—CONNERS &amp; CO.</i>	<b>Mosinee Paper Mills Co.</b> ..... 179 <i>Agency—KLAU-VAN PIETERSOM-DUNLAP ASSOCIATES</i>	<b>Plastic Manufacturers Inc.</b> ..... 36 <i>Agency—J. C. BULL, INC.</i>
<b>Kline Mfg. Co., The</b> ..... 19	<b>Moslo Machinery Co.</b> ..... 12	<b>Plastics Catalogue Corp.</b> ..... 43
<b>Kuhn &amp; Jacob Molding &amp; Tool Co.</b> ..... 189 <i>Agency—ELDRIDGE-NORTHROP, INC.</i>	<b>Muehlstein, H., &amp; Co.</b> ..... 201 <i>Agency—GOOLD AND TIERNEY INC.</i>	<b>Plastics Industries Technical Institute</b> ..... 221 <i>Agency—BEAUMONT &amp; HOHMAN, INC.</i>
<b>Kurz-Kasch, Inc.</b> ..... 69 <i>Agency—KIRCHER, HELTON &amp; COLLETT</i>	<b>Multi Color Graph Corp.</b> ..... 214	<b>Plax Corp.</b> ..... 61 <i>Agency—THE CHARLES BRUNELLE CO.</i>
	<b>N.R.K. Mfg. &amp; Engineering Co.</b> 214 <i>Agency—KREICKER &amp; MELOAN, INC.</i>	<b>Porter-Cable Machine Co.</b> ..... 16 <i>Agency—BARLOW ADV. AGENCY, INC.</i>
		<b>Pro-phy-lac-tic Brush Co.</b> ..... 54 <i>Agency—LAMBERT &amp; FEASLEY, INC.</i>

(Please turn to page 224)

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Reading Screw Co.....	225	Steel Co. of Canada Ltd., The...	225	Universal Plastics Corp.....	149
Recto Molded Products, Inc.....	168	Stekert, Martin M.....	188	Agency—CAYTON, INC.	
Agency—CREATIVE ADVERTISING		Agency—WALTER W. WILEY ADVERTISING		Valite Corp.....	173
Reed-Prentice Corp.....	8	Stensgaard, W. L. & Assoc., Inc.	146	Agency—BRANDT ADVERTISING CO.	
Agency—CUTLER & QUINN		Agency—RUTHRAUFF & RYAN INC.		Van Dorn Iron Works Co., The..	67
Reichhold Chemicals, Inc.....	133	Sterling Bolt Co.....	225	Agency—STEDFELD-BYRNE AGENCY	
Agency—MACMANUS, JOHN & ADAMS, INC.		Stricker-Brunhuber Co.....	213	Vapor Blast Mfg. Co.....	209
Respro Inc.....	49	Stronghold Screw Products Inc.	225	Agency—MORRISON ADV. AGENCY, INC.	
Agency—HORTON-NOYES CO.		Swedlow Plastics Co.....	151	Varcum Chemical Corp.....	65
Richardson Co., The.....	6	Synthetic Resins Ltd.....	196	Agency—KELLY & MENGLE, INC.	
Agency—THE BUCHEN CO.				Victory Mfg. Co.....	161
Robinson Industries, Inc.....	206			Agency—EARLE LUDGIN & CO.	
Agency—THE YOUNT CO.		Taylor Fibre Company.....	146	War Assets Administration.....	219
Rohden Mfg. Co.....	149	Agency—GRAY & ROGERS		Agency—FULLER & SMITH & ROSS INC.	
Agency—R. W. SAYRE CO.		Tech-Art Plastic Co.....	139	Watlow Electric Mfg. Co.....	154
Rohm & Haas Co.....	191	Agency—J. B. RUNDLE ADVERTISING		Agency—EGGERS-RANKIN ADV. SERVICE	
Agency—NEWELL-EMMETT CO.		Tennessee Eastman Corp.....	131	Watson-Stillman Co.....	15
Royle, John & Sons.....	195	Agency—KENYON & ECKHARDT INC.		Agency—O. S. TYSON & CO., INC.	
Russell, Burdall & Ward Bolt & Nut Co.....	225	Thropp, Wm. R. & Sons Co....	208	Weinman Bros., Inc.....	178
		Agency—RICKARD ADV. AGENCY, INC.		Agency—T. R. BAUERLE ADV. AGENCY	
		Timken Roller Bearing Co., The	141	Westinghouse Electric Corp.....	106
		Tinnerman Products, Inc.....	171	Agency—FULLER & SMITH & ROSS INC.	
		Agency—THE WHITE ADVERTISING CO.		Wheelco Instruments Co.....	38
				Agency—DON PROCTOR ADVERTISING	
Sarco Co., Inc.....	170	Union Bay State Chemical Co., Inc.....	209	White, S. S., Dental Mfg. Co., The.....	194
Agency—W. L. TOWNE ADVERTISING		Agency—BENNETT, WALTHER & MENADIER, INC.		Agency—PETERSON & KEMPNER, INC.	
Schwartz Chemical Co., Inc.....	184	Union Carbide & Carbon Corp... ..35, Inside Back Cover		Wiegand, Edwin L., Co.....	55
Agency—WALTER W. WILEY ADVERTISING		Agency—J. M. MATHES, INC.		Agency—SMITH, TAYLOR & JENKINS, INC.	
Seovill Mfg. Co.....	225	Union Pacific Railroad.....	66	Wilson Gold Stamping Machine Co.....	212
Shakeproof, Inc.....	225	Agency—THE CAPLES CO.		Wolverine Bolt Co.....	225
Shaw Insulator Co.....	60			Worcester Moulded Plastics Co... ..	226
Agency—THE CHARLES BRUNELLE CO.				Agency—C. JERRY SPAULDING INC.	
Sillcocks-Miller Co., The.....	199				
Agency—FRED H. EBERSOLD, INC.					
Southington Hardware Mfg. Co.	225				
Standard Tool Co.....	154				
Agency—THE DAVIS PRESS, INC.					



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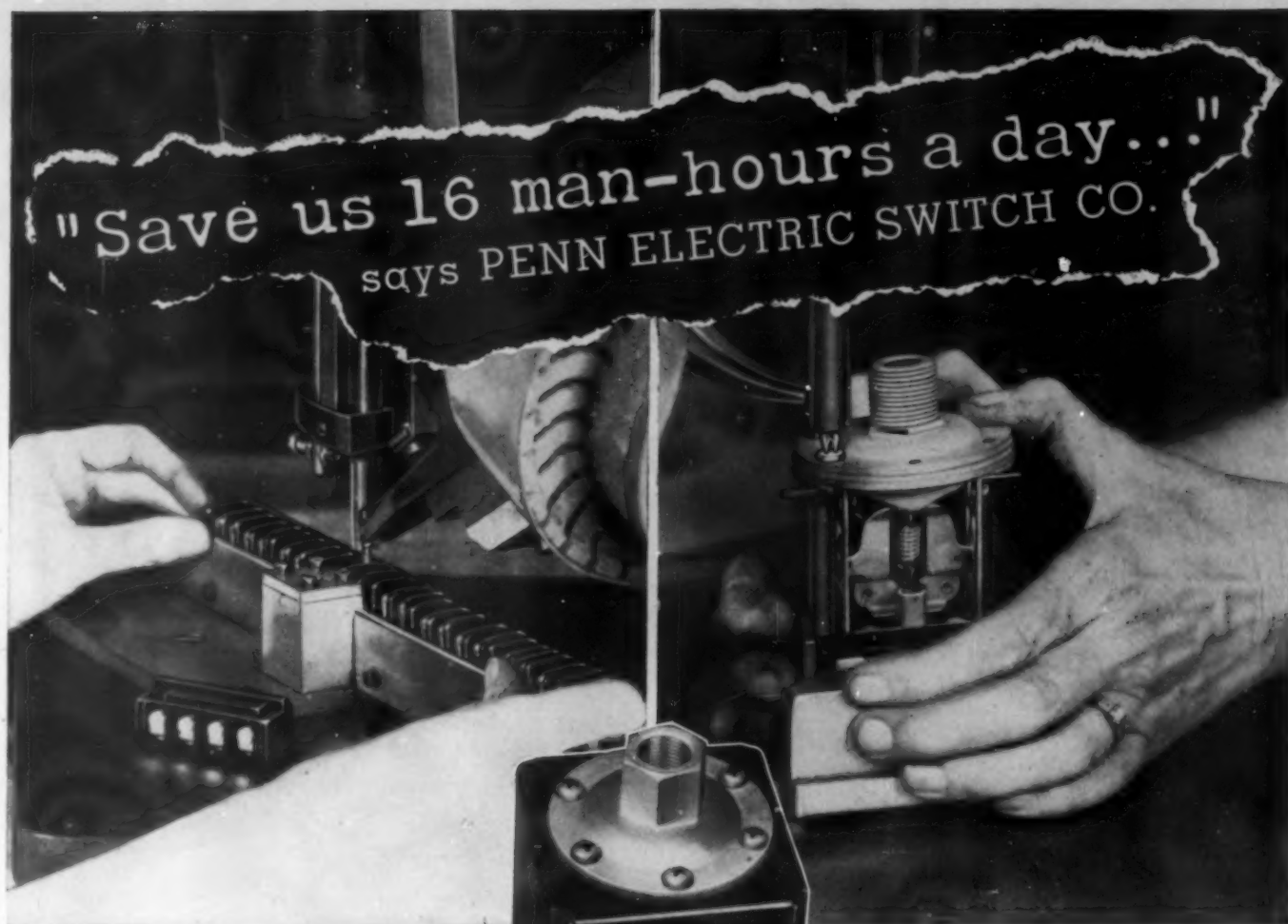
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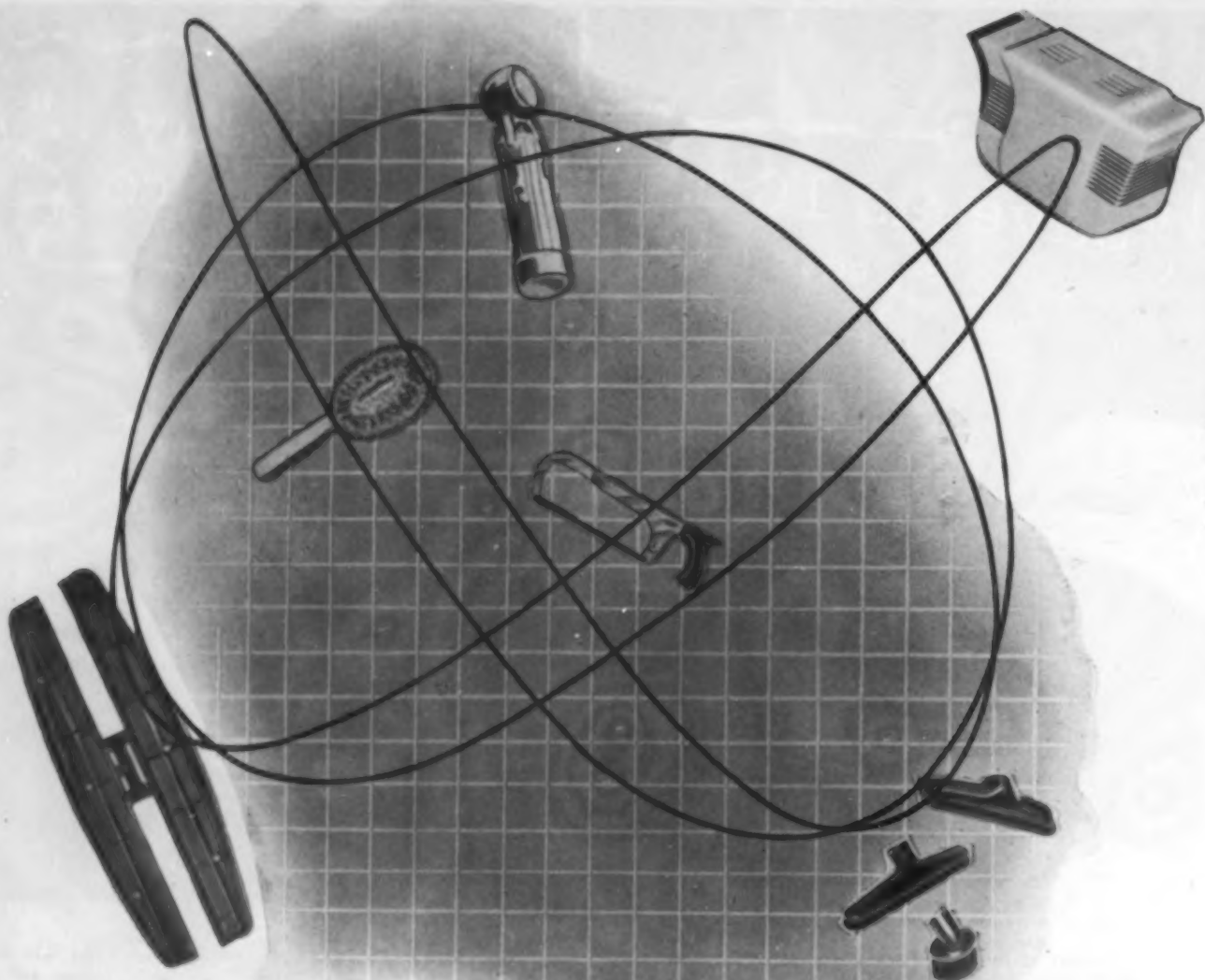
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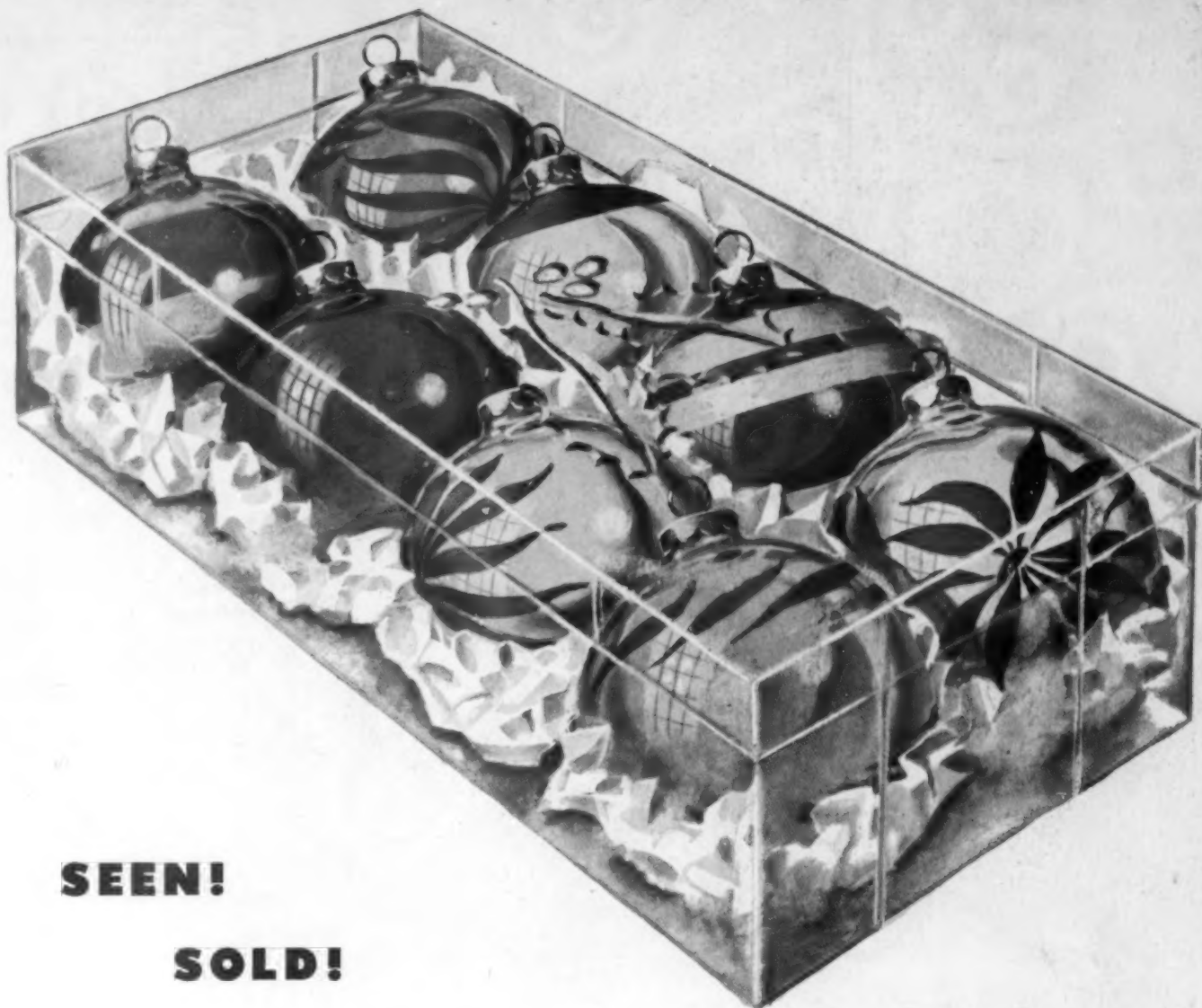
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
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